This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

THE UNIVERSITY OF MICHIGAN · LIBRARIES ·

THE NEW INTERNATIONAL ENCYCLOPÆDIA

EDITORS

DANIEL COIT GILMAN, LL. D.
PRESIDENT OF JOHNS HOPKINS UNIVERSITY (1876–1901)
AFTERWARDS PRESIDENT OF THE CARNEGIE INSTITUTION OF WASHINGTON

HARRY THURSTON PECK, PH. D., L. H. D.
PROFESSOR IN COLUMBIA UNIVERSITY

FRANK MOORE COLBY, M. A.
LATE PROFESSOR OF ECONOMICS
IN NEW YORK UNIVERSITY

VOLUME XIX

NEW YORK
DODD, MEAD AND COMPANY
1906

G.R.k.2
AE
5
.M532

Copyright, 1904, 1905, 1906
BY DODD, MEAD AND COMPANY

All rights reserved

PRESSWORK BY THE UNIVERSITY PRESS, CAMBRIDGE, U. S. A.
BINDING BY BOSTON BOOKBINDING CO., CAMBRIDGE, U. S. A.

ILLUSTRATIONS IN VOLUME XIX.

COLORED PLATES

Facing Page
Song Birds, American 256
Frogs and Toads, American 318
Totem Poles, Southern Alaska 370
Game Fishes, American 486
University Gowns—American Usage 738
University Gowns—British Usage 740

MAPS

Tasmania 52
Temperature in the United States, Average in January 116
Temperature in the United States, Average in July 116
Tennessee 130
Texas 162
Tobacco in the United States 320
Transportation—Commercial Map of the World 420
Transvaal Colony 424
Turkey in Europe 556
Turkey in Asia 558
United States, Eastern 644
United States, Western 646
United States, Physical 648
Gold, Silver, and Copper in the United States 654
Wheat in the United States 660
Oats in the United States 662
Density of the Population in the United States 696
Early Colonial Grants 704
United States in 1789 and 1808 710
United States in 1816 712
United States in 1852 718
United States, Showing Accessions of Territory 732
Uruguay 766
Utah 774

ENGRAVINGS

Taj Mahal 4
Tamarack and Larch 14
Tansy, etc. 24

161899

FACING PAGE
TAPIRS AND HIPPOPOTAMUS 30
TEA 76
TELESCOPE 106
TENIERS, DAVID ("The Rustic Wedding") 126
TENNYSON 136
THORWALDSEN ("Christ") 248
TITIAN ("The Tribute Money") 310
TORPEDO BOATS, SUBMARINE 358
TREE FERN AND TRAVELER'S TREE 430
TRILOBITES, REPRESENTATIVE 464
TROGON, HOOPOE, ETC. 478
TROUT AND GRAYLING 488
TROYON ("Oxen Going to Work") 492
TULIP TREE 528
TUNNEL — TYPICAL SECTIONS OF THE NEW YORK SUBWAY 546
TURNER, J. M. W. ("The Grand Canal, Venice") 568
TYPECASTING AND TYPESETTING MACHINES 592

KEY TO PRONUNCIATION.

ā	as in ale, fate. Also see **ĕ**, below.
ā̇	“ “ senate, chaotic. Also see **ĕ**, below.
â	“ “ glare, care.
ă	“ “ am, at.
ä	“ “ arm, father.
ȧ	“ “ ant, and final *a* in America, armada, etc. In rapid speech this vowel readily becomes more or less obscured and like the neutral vowel or a short ụ (ŭ).
a	“ “ final, regal, where it is of a neutral or obscure quality.
a̤	“ “ all, fall.
ē	“ “ eve.
ē̇	“ “ elate, evade.
ĕ	“ “ end, pet. The characters *ĕ*, *ā*, and *ā̇* are used for *ä* in German, as in Gärtner, Gräfe, Hähnel, to the values of which they are the nearest English vowel sounds. The sound of Swedish *ä* is also indicated by *ĕ*.
ẽ	“ “ fern, her, and as *i* in sir. Also for *ö*, *oe*, in German, as in Göthe, Goethe, Ortel, Oertel, and for *eu* and *oeu* in French, as in Neufchâtel, Crèvecœur; to which it is the nearest English vowel sound.
e	“ “ agency, judgment, where it is of a neutral or obscure quality.
ī	“ “ ice, quiet.
ī̇	“ “ quiescent.
ĭ	“ “ ill, fit.
ō	“ “ old, sober.
ō̇	“ “ obey, sobriety.
ô	“ “ orb, nor.
ŏ	“ “ odd, forest, not.
o	“ “ atom, carol, where it has a neutral or obscure quality.
oi	“ “ oil, boil, and for *eu* in German, as in Feuerbach.
o͞o	“ “ food, fool, and as *u* in rude, rule.
ou	“ “ house, mouse.
ū	“ “ use, mule.
ū̇	“ “ unite.
ŭ	“ “ cut, but.
ụ	“ “ full, put, or as *oo* in foot, book. Also for *ü* in German, as in München, Müller, and *u* in French, as in Buchez, Budé; to which it is the nearest English vowel sound.
û	“ “ urn, burn.
y	“ “ yet, yield.
B	“ “ the Spanish Habana, Cordoba, where it is like a *v* made with the lips alone, instead of with the teeth and lips.
ch	“ “ chair, cheese.
D	as in the Spanish Almodovar, pulgada, where it is nearly like *th* in English then, this.
g	“ “ go, get.
G	“ “ the German Landtag, and *ch* in Feuerbach, buch; where it is a guttural sound made with the back part of the tongue raised toward the soft palate, as in the sound made in clearing the throat.
H	as *j* in the Spanish Jijona, *g* in the Spanish gila; where it is a fricative somewhat resembling the sound of *h* in English hue or *y* in yet, but stronger.
hw	“ *wh* in which.
K	“ *ch* in the German ich, Albrecht, and *g* in the German Arensberg, Mecklenburg; where it is a fricative sound made between the tongue and the hard palate toward which the tongue is raised. It resembles the sound of *h* in hue, or *y* in yet; or the sound made by beginning to pronounce a *k*, but not completing the stoppage of the breath. The character K is also used to indicate the rough aspirates or fricatives of some of the Oriental languages, as of kh in the word Khan.
n̲	as in sinker, longer.
ng	“ “ sing, long.
N	“ “ the French bon, Bourbon, and *m* in the French Etampes; where it is equivalent to a nasalizing of the preceding vowel. This effect is approximately produced by attempting to pronounce 'onion' without touching the tip of the tongue to the roof of the mouth. The corresponding nasal of Portuguese is also indicated by N, as in the case of São Antão.
sh	“ “ shine, shut.
th	“ “ thrust, thin.
TH	“ “ then, this.
zh	as *z* in azure, and *s* in pleasure.

An apostrophe ['] is sometimes used to denote a glide or neutral connecting vowel, as in tā'b'l (table), kăz''m (chasm).

Otherwise than as noted above, the letters used in the respellings for pronunciation are to receive their ordinary English sounds.

When the pronunciation is sufficiently shown by indicating the accented syllables, this is done without respelling; as in the case of very common English words, and words which are so spelled as to insure their correct pronunciation if they are correctly accented. See the article on PRONUNCIATION.

A PARTIAL LIST OF THE LEADING ARTICLES IN VOLUME XIX.

TALMUD.
Professor Morris Jastrow.
TAOISM.
Dr. Paul Carus.
TARIFF.
Professor Henry R. Seager.
TASSO.
Professor J. D. M. Ford.
TAX.
Professor Alvin Sydney Johnson and Dr. Roland P. Falkner.
TECHNICAL EDUCATION.
Professor Paul Monroe.
TELEGRAPH.
Mr. Herbert Treadwell Wade.
TELEGRAPHY, SUBMARINE.
Mr. Charles Shattuck Hill and Mr. Moses Nelson Baker.
TEMPERANCE.
Professor Samuel McCune Lindsay.
TEUTONIC LANGUAGES.
Professor Maurice Bloomfield.
TEXTUAL CRITICISM.
Professor Mortimer L. Earle.
THEATRE.
Mr. Philip G. Hubert, Jr., Mr. John Daniel Kaps, and Professor James Morton Paton.
THEISM.
Dr. Henry A. Davies.
THEOLOGICAL EDUCATION.
Professor Francis P. Siegfried and Professor Nathaniel Schmidt.
THEOSOPHY.
Mr. Harold W. Percival.
THERAPEUTICS.
Dr. Thomas Luther Coley.
THERMO-CHEMISTRY.
Mr. Martin A. Rosanoff.
THERMOMETER.
Professor Cleveland Abbe.
THIRTY YEARS' WAR.
Professor Edwin A. Start.
TITIAN.
Dr. George Kriehn.
TITLE (in law).
Mr. John Daniel Kaps.
TOBACCO.
Dr. Alfred Charles True and Dr. Albert Warren Ferris.
TOLSTOY.
Mr. Judah Achilles Joffe.
TORPEDO BOAT, SUBMARINE.
Lieutenant-Commander Lewis Sayre Van Duzer.
TOTEMISM.
Professor Edward W. Hopkins.
TOXICOLOGY.
Dr. Albert Warren Ferris.
TRACT SOCIETIES.
Dr. Henry Lewis.
TRADE UNIONS.
Professor Richard T. Ely and Professor Thomas Sewall Adams.
TRAMP.
Professor John James McCook.
TRANSCENDENTALISM.
Professor Evander Bradley McGilvary and Professor William Peterfield Trent.
TRANSFORMER.
Mr. George H. Gibson.
TRANSMISSION OF POWER BY ELECTRICITY.
Professor Michael Idvorsky Pupin.
TREATY.
Dr. James Wilford Garner.
TRESPASS.
Professor Francis M. Burdick.
TRIGONOMETRY.
Professor David Eugene Smith.
TRILOBITA.
Mr. Gilbert Van Ingen.
TROY.
Professor James Morton Paton.
TRUST (in law).
Dr. Harlan F. Stone.
TRUST COMPANIES.
Mr. Alexander Dana Noyes.
TRUSTS.
Professor Jeremiah Whipple Jenks.
TUBERCULOSIS.
Dr. Albert Warren Ferris and Dr. Frederick R. Bailey.
TUNNEL.
Mr. Charles Shattuck Hill.
TURKEY.
Mr. Cyrus C. Adams, Dr. W J McGee, and Professor Edwin A. Start.
TURKISH LANGUAGE AND LITERATURE.
Dr. Henry Otis Dwight.
TURNER.
Dr. George Kriehn.
UNEMPLOYMENT.
Professor Davis Rich Dewey.
UNITARIANISM.
Dr. Samuel Atkins Eliot.
UNITED BRETHREN IN CHRIST.
Professor Samuel D. Faust.
UNITED STATES.
Professor Albert Perry Brigham, Professor Cleveland Abbe, Mr. David Hale Newland, Professor Alvin Sydney Johnson, General Theophilus F. Rodenbough, Lieutenant-Commander Lewis Sayre Van Duzer, Mr. Isaac J. Cox, Dr. James Wilford Garner, Dr. Harry A. Cushing, and others.
UNIVERSITY.
Professor Paul Monroe.
UTILITARIANISM.
Professor Evander Bradley McGilvary.
VACCINATION.
Dr. Albert Warren Ferris and Mr. John Daniel Kaps.
VALUE.
Professor Alvin Sydney Johnson.

THE NEW INTERNATIONAL ENCYCLOPÆDIA

TAHAR′KA (?-c.668 B.C.). The name of the third King of Egypt of the twenty-fifth or Ethiopian dynasty, who ruled from about B.C. 694-693 to 668-667. He is the Tirhakah of the Bible, the **Τάρκος**, or **Ταρκός**, of Manetho, and the Tarqû of the Assyrian inscriptions. He seems to have been a usurper who seized upon the throne on the death of Shabataka, and strengthened his hold upon it by marrying the widow of King Shabako. In the Old Testament (Isa. xxxvii. 9; II. Kings xix. 9) he is said to have come to the aid of Hezekiah, King of Judah, when Jerusalem was besieged by Sennacherib. It would seem that no battle took place between the Egyptian and Assyrian forces, but that the latter, before they met, were forced to retreat by a pestilence. In B.C. 670 Esarhaddon, the son of Sennacherib, invaded Egypt, defeated Taharka in several engagements, sacked Memphis, and marched as far as Thebes, which surrendered to him. Taharka, in the meantime, retired to Nubia, but returned in the following year, and, deposing all the princes and other officers appointed by the Assyrian King, established himself in Memphis. Upon receipt of this intelligence, Esarhaddon gathered an army and was proceeding to the relief of his Egyptian vassals when he died on the way. His army, however, continued the march and drove Taharka out of Lower Egypt. Retreating as far as Thebes, Taharka seized upon that city and was preparing to renew the contest when he died. Taharka was an active builder, and memorials of him are found in many parts of Egypt and Nubia. At Napata (Jebel Barkal) he built a temple whose sanctuary was hewn out of the solid rock of the mountain, and he diligently restored the temples of Thebes, which he made his capital. Consult: Wiedemann, *Aegyptische Geschichte* (Gotha, 1884-88); Budge, *A History of Egypt* (New York, 1902).

TAHITI, tä′hē-tē *or* tȧ-hē′tē, or **OTAHEITE**. The largest of the Society Islands (q.v.), situated in latitude 17° 45′ S., longitude 149° 20′ W. Area, 402 square miles (Map: World, Western Hemisphere, L 6). The island consists of two unequal and nearly circular portions connected by a narrow isthmus. These are the remnants of old volcanoes, and rise in a succession of concentric terraces to the summits, the higher of which has an altitude of 7668 feet. The mountains are, however, very much eroded by numerous streams, which have cut large valleys and deep gorges down the slopes, leaving in many places isolated crags which make the scenery very romantic. The climate is warm, but equable, the temperature ranging from 60° to 90°. The rainfall is abundant, and the whole island is covered with a luxuriant vegetation. The central peaks are surrounded by a low strip of coastland consisting of volcanic detritus, which, mixed with coral sands from the surrounding reefs, makes an extremely fertile soil. Nevertheless agriculture is in a backward state, and only a few square miles of land are under cultivation. The population, in 1900, was 10,750. The chief town is Papéiti, the capital of the French establishments in the Eastern Pacific, with a cathedral, arsenal, hospital, and a population, in 1900, of 4282, about one-half of whom were French. For history and political and economic conditions, see SOCIETY ISLANDS.

The Tahitians are typical Polynesians of the brown race. Many of them could be called handsome, and their general disposition is one of gayety with an undercurrent of cruelty and deceit, though their bad characteristics have, doubtless, been exaggerated. A remarkable institution of the Society Islanders was the Areois (q.v.), a society for the cultivation of poetry, the dance, and the drama combined with the indulgence of the sexual passion. Consult: Lutteroth, *O-Taïti* (Paris, 1843); Vincendon, *Iles Taïti* (ib., 1844); Buschmann, *Aperçu de la langue des îles Marquises et de la langue taïtienne* (Berlin, 1843).

TAHITI APPLE. See HOG PLUM.

TAHLEQUAH, tä′le-kwä′. The capital of the Cherokee Nation, Indian Territory, 80 miles northwest of Fort Smith, Ark. (Map: Indian Territory, J 3). It has the Tahlequah Institute, Cherokee Academy, male and female seminaries, and the Cherokee National Library. Tahlequah was settled in 1836 and was incorporated in 1889. Population, in 1900, 1482.

TAHOE, tȧ-hō′, Lake. A lake in the Sierra Nevada, on the boundary between Nevada and California (Map: California, C 2). It is 21 miles long and 8 miles broad, and lies at an altitude of 6225 feet. Its greatest depth is over 1500 feet, and its water is remarkably clear. It discharges through the Truckee River into Pyramid Lake, and it has been planned to draw its water through tunnels for irrigation purposes.

TAHPANHES, tȧ-păn′hēz (Heb. *Takhpankhēs*), or Tehaphnehes (Heb. *Tekhaphnekhēs*). A city of Northeastern Egypt mentioned in the Bible. It is probably to be identified with the town called by the Greeks Daphnæ, which was situated in the Delta about 25 miles southwest of Pelusium. Daphnæ was a military post of some importance in the time of Psammetichus I. (q.v.), who fortified it and established in it a garrison of Greek mercenaries. The site, represented by the modern Tel-Defenneh, was explored by Petrie in 1886. Consult Petrie, *Tanis*, Part ii. (London, 1887).

TAHR. See Thar.

TAIL′FER, Patrick. An American colonist, remembered for the polemic entitled *A True and Historical Narrative of the Colony of Georgia in America from the first Settlement thereof until the Present Period* (1741). Tailfer, who was a physician and had emigrated to Georgia, disapproved of the administration of the colony. In 1740 he went to Charleston, where, with the assistance of Hugh Anderson and David Douglass, he wrote and published the work mentioned above. In this, with unusual cleverness and poise, he mercilessly attacked Governor Oglethorpe.

TAILLANDIER, tȧ′yäN′dyȧ′, René Gaspard Ernest, commonly called Saint-René Taillandier (1817-79). A French writer on literature and history, born in Paris. He studied law, but turned to literature and philosophy, and in 1840 attracted some attention with his long poem *Béatrice.* In 1841 he studied at Heidelberg, and at the end of that year became a member of the Faculty of Letters at Strassburg. In 1843 he received the doctor's degree at Paris for his *Scot Erigène et la philosophie scholastique,* and then was called to the chair of French literature at Montpellier. From 1863 he was a professor in the Faculty of Letters at Paris, and in 1873 became a member of the Academy. Especially noteworthy are his writings on German literature and philosophy, which began in 1843 in the *Revue des Deux Mondes.* His works include: *Histoire de la jeune Allemagne* (1848); *Etudes sur la révolution en Allemagne* (1853); *Allemagne et Russie* (1856), a study made timely by the Crimean war; *Histoire et philosophie religieuse* (1860); *Littérature étrangère, écrivains et poètes modernes* (1861); *La Comtesse d'Albany* (1862); *Correspondance entre Goethe et Schiller* (1863); *Corneille et ses contemporains* (1864); *Maurice de Saxe* (1865), a critical biography; *La Serbie au XIXème siècle: Kara-George et Milosch* (1875); *Dix ans de l'histoire d'Allemagne* (1875); and *Le roi Léopold et la reine Victoria* (1878).

TAILLE, tī′y′. In Mediæval England and France, an arbitrary tax enacted by a seignior from his vassal. In France, specifically a tax which was originally imposed for the maintenance of the national defence, and which in the course of time came to fall on the lower classes only, exemption from the tax being in fact the great mark of distinction between the privileged and non-privileged classes, the *taillables* and *non-taillables.* See Serf; France.

TAILLE, Jean de la. See La Taille, Jean de.

TAILOR, Robert. An English dramatist, of whose life very little is known. He is remembered for his comedy *The Hog Hath Lost His Perle,* which was presented in London in 1613 and was printed the following year. The play, which in plot is similar to Otway's *Orphan,* is valuable for its large number of dramatic allusions. As a drama, however, it has not great merit. Tailor is supposed to be the author of *Sacred Hymns,* fifty rather meritorious paraphrases from the Psalms.

TAILOR-BIRD. One of a group of small Oriental thrushes or warblers of the genus Orthotomus, which stitch together leaves to sustain their nest. There are many species and allies, but the tailor-bird proper is *Orthotomus sutorius,* which is common in India and eastward about gardens. It has a back of olive green, is white beneath, the crown of the head is chestnut, and in the male two middle tail-feathers are greatly elongated. The bill is long and very straight and slender. Jerdon writes that it makes its nest of cotton and various other soft materials, and draws one leaf or more, generally two leaves, on each side of the nest, and stitches them together with cotton, either woven by itself, or threads picked up about a house. The process has been witnessed, however, by few competent observers. The fullest account extant is in Hume, *Nests and Eggs of Indian Birds* (London, 2d ed., 1890). The birds of a related genus, Cisticola (see Fantail), "ply the same trade on stems of grass, confining them by stitches above the nest, which is built among them and takes a globular form." See Plate of Pensile Nests of Birds accompanying article Nidification.

TAIMYR, tī-mēr′. A large peninsula of Western Siberia, extending into the Arctic Ocean and forming the northernmost part of the Asiatic mainland (Map: Asia, K 1). It belongs to the district of Turukhansk in the Government of Yeniseisk. By Taimyr Bay the peninsula is divided into two parts, of which the more easterly is the larger and reaches the parallel of 77° 30′ north latitude. This part of the peninsula has many headlands and contains the Byrranga Mountains, which are only about 1000 feet in height. The Taimyr River rises in 73° north latitude, flows through the large Lake Taimyr (about 1000 square miles), and empties into Taimyr Bay under 75° 35′. The flora is poorer than in that part of Greenland which is not covered by the ice-cap. The country is only occasionally visited, by nomadic Samoyeds and Ostiaks. It was first explored by the Russian traveler Alexander Theodor von Middendorff.

TAINAN, tī′nän′. A city of southern Formosa, known as Tai-wan fu until 1886, and the capital of the island until 1896. It is on a level plain of considerable extent, 3 miles east of Formosa Channel, with which it is connected by a canal. Its walls have a circuit of about 6 miles and inclose many open spaces, the principal markets being in the western suburbs, where most of the business is done. The Dutch made it their capital in the seventeenth century. Tainan was a treaty-port under Chinese rule, and under Japanese control it has the same status. It has three steam sugar mills and one rice mill. Population, about 140,000. The foreign population is very small.

TAINE, tān, Hippolyte Adolphe (1828-93). A French historian and critic of literature and art, born at Vouziers, April 21, 1828. He went to Paris in 1841, entered the Ecole Normale in 1848, where he showed much independence and restiveness under its philosophic eclecticism. In 1851 he was appointed to the chair of philosophy at the College of Toulon, but he immediately resigned, studied medicine and the sciences, and so brought himself into touch with the spirit of the rising generation, with whom his essays on *La Fontaine, Livy,* and *Les Philosophes français du XIXème siècle* (1853-56) won immediate recognition, while his *Voyage aux eaux des Pyrénées* (1855) showed his mastery of orderly and minute observation. Thus he compelled recognition, and the Government that had thought him dangerous in 1854 made him professor in the Ecole des Beaux-Arts in 1864. Here he gave several series of lectures on the history of art that are models of philosophic criticism, and, applying the same principles in another field, published a monumental *Histoire de la littérature anglaise* (1864). Then followed *Idéalisme anglais* (1864); *Positivisme anglais* (1864), the latter a study of J. S. Mill; *Philosophie de l'art* (1865); *Philosophie de l'art en Italie* (1866); *Voyage en Italie* (1866-72); *L'idéal dans l'art* (1867); the cynically amusing *Notes sur Paris* (1867); the important *De l'intelligence* (1870); *Notes sur l'Angleterre* (1872); and finally his greatest work, *Origines de la France contemporaine,* consisting of *Ancien régime* (1875), *La Révolution* (1878-84), and the *Régime moderne* (1890). *A Life and Letters of H. Taine* (1828-52) was published in French and in English in 1902.

Taine was the theorist of naturalism, of immense yet systematized erudition, and of a logic that was almost mechanical. He represents in criticism the scientific spirit that was making itself felt almost simultaneously in all branches of French intellectual activity, in the poetry of the Parnassians, the philology of Renan, the fiction of Flaubert, the dramas of the younger Dumas, the high art of Meissonier, and the low art of Forain. The analytic, meticulous spirit of his generation found in his "little facts, well chosen, important, significant, amply substantiated, minutely noted, the material of every science." He sought to make psychology, æsthetics, and literary criticism into exact sciences, capable of rigorous analysis and systematic deduction. Physiology determined psychology, environment was the cause of literary evolution. Moral standards fell under the same dissection. "Virtue and vice are products like vitriol and sugar." His is always the interest of the naturalist, not of the artist. The style was like the man and like the philosophy, grave, sincere, simple, almost always serene. There is in his work hardly a trace of irony, of strain or of enthusiasm, none at all of sentimentality or of mysticism. His system may not have been deep, but it was wonderfully opportune, and Taine was a guiding light to the intellectually productive men of France almost until his death. Oxford gave him an honorary degree of LL.D. in 1871. He was tardily elected to the French Academy in 1878, and died in Paris, March 5, 1893. Most of his works have been translated into various languages. Consult: Bourget, *Essais de psychologie contemporaine,* vol. i. (Paris, 1887); Lemaître, *Les contemporains,* vol. iv. (ib., 1890-92); Monod, in *Contemporary Review* (London, 1893); Margerie, *Hippolyte Taine* (Paris, 1894); Boutmy, *Taine, Scherer, Laboulaye* (ib., 1901); Tiraud, *Hippolyte Taine* (ib., 1901).

TAI-NGAN FU, tī'nän'fōō'. A departmental city of the Province of Shan-tung, China, situated at the foot of the famous Mount Tai (see Tai Shan), 60 miles south-southeast of Tsi-nan fu, the capital of the province. The importance of Tai-ngan is due chiefly to the immense numbers of pilgrims who come to visit Mount Tai. Its suburbs on the south and west, however, are large, populous, and prosperous. The most important of the numerous temples of Tai-ngan is the Tai Temple, covering several acres, surrounded by a strong wall and containing many fine old cypresses. Population, with suburbs, about 80,000.

TAI-PEH, tī'pā', or **TAI-PAK,** tī'päk' (pronounced by the Japanese *Dai-hokū,* dī'hok'ōō). The capital of the Japanese island of Formosa (q.v.). It is a small walled city, about 13 miles from Tamsui (q.v.), with which it is connected by rail, as well as with Kelung (q.v.). Near it is found the large and populous town of Bangka or Mangka, the centre of the tea trade. The total population of Tai-peh proper and of the suburbs is estimated at over 100,000, including nearly 6000 Japanese.

TAI-PING (tī'pĭng') **REBELLION** (abbreviation of Chin. *t'ai p'ing chao,* great peace dynasty). The name given by foreigners to the uprising which threatened the overthrow of the Chinese Empire (1850-64). See Chinese Empire (section *Modern History*) and Hung Siu-Ts'euen.

TAIRA, tä'ē-rä. A Japanese clan of Imperial descent, one of the four great families, Fujiwara, Minamoto, and Tokugawa being the others, which have been most distinguished in the history of Japan. The Taira family was established in the ninth century, when some of its members were given the control of provinces in the west. In 814 another house, the Minamoto, also of Imperial descent, had been put in control in the east. For centuries the Taira and the Minamoto were content in their respective spheres, but in the twelfth century they came into conflict over the succession to the Imperial throne. The head of the Taira was Kiyomori, a man of great ability and of large experience in warfare. He was successful in his plans, defeated the Minamoto, and made himself supreme in the Empire. He took the office of Prime Minister from the Fujiwara family, married his daughter to the Emperor, filled all important offices with his clansmen, humiliated the Fujiwara nobles, and attempted the extermination of the Minamoto family. After his death in 1181 the Minamoto clan obtained possession of the eastern part of Japan, and then of Kioto. The Taira retreated westward, were pursued by Yoshtsune, and finally defeated in 1185 in the sea fight of Dan-no-Ura.

The clan was all but exterminated and never regained its importance.

TAIRA. A South American weasel-like carnivore. See Tayra.

TAI SHAN, tī′ shän′. The most easterly of the Five Yo or great sacred mountains of China whose worship goes back into the fabulous period of Chinese history. It is a great massive complex of rugged limestone ridges, buttressed on the east and southeast by the mountains and hills which cover most of the Shan-tung peninsula. Its highest peak is 4111 feet above the level of the sea. It is about 60 miles south-southeast of Tsi-nan fu, the capital of Shan-tung (q.v.), and is thickly dotted, especially on the south side, with both Buddhist and Taoist temples, monasteries, and pavilions. It is annually visited by tens of thousands of pilgrims from all parts of the country.

TAIT, Archibald Campbell (1811-82). Archbishop of Canterbury. He was born in Edinburgh, and was brought up as a Presbyterian. During his studies at the University of Glasgow, to which he went in 1827, he determined to enter the ministry of the Church of England, and went up to Balliol College, Oxford, in 1830. He took his degree there in 1833, was elected fellow in 1834, and ordained in 1836. He steadfastly refused to be carried away by the Oxford Movement, and joined with three other tutors in a famous protest against the principle involved in Tract XC. In 1842 he succeeded Dr. Arnold as head master of Rugby, which he left in 1850 for the deanery of Carlisle. In 1856 he became Bishop of London, and, amid the difficulties of times full of bitter controversy, won the respect of all by his courage and impartiality. The same may be said of his administration of the still more difficult post of the primacy, on which he entered at the beginning of 1869. He took a tolerant position toward the ritualists throughout the excitement which caused the passing of the Public Worship Regulation Act in 1874, and on all questions showed independence and firmness. Consult his biography by Davidson (afterwards his successor) and Benham (London, 1891).

TAIT, John Robinson (1834—). An American landscape painter and author, born in Cincinnati, Ohio. He studied art in Florence, Düsseldorf, Munich, and the Tyrol. He wrote a German comedy *Ein aufrichtiges Heiratsgesuch*, and, in English, *European Life, Legends, and Landscape* (1859). His paintings, several of which were exhibited at Philadelphia in the Centennial Exhibition, include "Siebengebirge," "Under the Willows," "Tyrolean Cottage," and "Landscape and Cattle."

TAIT, Peter Guthrie (1831-1901). A Scotch physicist, born at Dalkeith, Scotland, and educated at Edinburgh University and Peterhouse, Cambridge, where he was made a fellow in 1852. He was appointed professor of mathematics in Queen's College, Belfast, in 1854, and was professor of natural philosophy in the University of Edinburgh from 1860 to the time of his death. He carried on many important investigations in mathematics and physics, particularly on the mathematical and theoretical side of the latter science. His most famous work in mathematics was on quaternions, while his studies in thermodynamics and thermo-electricity were of unusual value. His papers on the kinetic theory of gases are among his many important contributions to science, and his various works cited below are marked by conciseness and lucidity of statement. He was the author of: *Dynamics of a Particle* (1865); *Elementary Treatise on Natural Philosophy* (1867), with Lord Kelvin (then Sir William Thomson); *Quaternions* (1867); *Thermodynamics* (1868); *Recent Advances in Physical Science* (1876); *Heat* (1884); *Light* (1884); *Properties of Matter* (1885); *Dynamics* (1895); and other works, including *Scientific Papers* (1898) and Newton's *Laws of Motion* (1899). He also wrote in coöperation with Professor Balfour Stewart *The Unseen Universe.*

TAITTIRIYA, tī′tė-rē′yȧ (Skt., from *Tāittiri*, name of an ancient Hindu sage). The title of a school of the Yajur-Veda and of the redaction of the Yajur-Veda itself, which belongs to that particular school. See Veda.

TAIWAN, tī′wän′ (Chin., terraced bay). The name by which the island of Formosa (q.v.) is known to both the Chinese and Japanese.

TAI-YUEN FU, tī′yo͞o-ĕn′fo͞o′. A walled city of China, capital of the Province of Shan-si. It stands between loess-covered hills near the head of a fertile plain 30 to 40 miles wide, about 70 miles long, 3000 feet above the level of the sea. Both coal and iron are worked near the city on the west, and there are silver mines about 65 miles north. The coal is bituminous and is of fine quality. The city consists, like Peking, of an 'inner' and an 'outer' city, the 'inner' on the north and the 'outer' on the south. The former measures 2⅝ miles by 1⅝, is surrounded by walls of moderate height, and has eight gates with towers over each and on the corners. The outer city is surrounded by mud walls, with three gates, one of which is kept closed for Imperial use. There is no extra-mural population. Among the buildings worthy of mention is the *Wan-Show Kung*, or 'palace of ten thousand ages,' arranged as a temple, roofed with yellow tiles, and containing one room, in which is the Imperial tablet. There is an Imperial gun and cannon foundry here. Population, 200,000.

TAJIKS, tȧ-zhēks′. The term applied particularly to the rural population of Eastern Persia, and generally to their representatives and congeners scattered from Constantinople to the borders of China, and from Orenburg to the Indian Ocean. It is sometimes more of a descriptive than a racial epithet. There are 'mountain Tajiks' and 'Tajiks of the Plain'—the Galchas (q.v.) of the Pamir being also known as 'mountain Tajiks.' The Tajiks are rather above the average in height, brachycephalic, and show traces of Turkish intermixture. It is possible that the Galchas and Tajiks may represent an Asiatic section of the so-called Alpine race of Western Europe. Both peoples are thus Aryan intruders into their respective areas, who have more or less mingled with the preëxisting non-Aryan population. Consult: Ujfalvy, *Les Aryens au nord et au sud de l'Hindou Kouch* (Paris, 1896); Houssay, *Les races humaines de la Perse* (ib., 1887).

TAJ MAHAL, täzh mȧ-häl′ (Pers., Crown of Mahal). A white marble mausoleum a mile

THE TAJ MAHAL

east of Agra, India, built by Shah Jehan as a burial place for his favorite wife, who died in 1629. It is said to have occupied twenty-two years in building and its cost is variously stated at from $9,000,000 to $60,000,000. The building is octagonal, with sides of 130 feet and a height of 70 feet. It is surmounted by a dome which rises to the height of 120 feet above the roof, and is flanked by four minarets 133 feet high. In the central chamber, above the vault containing the bodies of the Emperor and his wife, are two cenotaphs surrounded by a fine marble screen. The exterior of the mausoleum is covered with arabesques and passages from the Koran in mosaic.

TAKAMATSU, tä'kȧ-mät'so͞o. The capital of the Prefecture of Kagawa in Japan, on the northern coast of Shikoku (Map: Japan, D 6). It was formerly the seat of a daimio and has a fine landscape garden in its southern suburb. Population, in 1898, 34,416.

TAKAOKA, tä'kȧ-ō'kȧ. A town in the Prefecture of Toyama, Central Hondo, Japan, 10 miles by rail northeast of Kanazawa (Map: Japan, E 5). It manufactures dyes and hardware. Population, in 1898, 31,490.

TAKASAKI, tä'kȧ-sä'kē. A town in the Prefecture of Gumma, Central Hondo, Japan, situated 63 miles by rail northwest of Tokio (Map: Japan, F 5). It has manufactures of cotton and silk. Population, in 1898, 30,893.

TAKASHIMA, tä'kȧ-shē'mȧ. A small island of Japan, about eight miles southwest of the entrance to the harbor of Nagasaki (Map: Japan, J 2). It is noted for its extensive coal mine, which has been worked since the middle of the eighteenth century.

TAKATA, tȧ-kä'tȧ. A town in the Prefecture of Niigata, Northern Hondo, Japan, 42 miles by rail north of Nagano. It has extensive manufactures of cotton goods (Map: Japan, F 5). The town was formerly the residence of the daimio of Sakakibara belonging to one of the most noted feudal families of Japan. Population, in 1898, 20,315.

TAKIN, or GNU-GOAT. A goat-like animal (*Budorcas taxicolor*) of Eastern Thibet, allied to the serow (q.v.), but having horns (in both sexes) bent at right angles, and resembling those of a gnu. Little is known of its habits.

TAKOW, or **TAKAO,** tä'kou'. A village on the west coast of Formosa, thrown open in 1864 by the Chinese for foreign residence and trade and continued as a treaty-port by the Japanese (Map: Japan, E 8). It lies 20 miles south of Tainan (q.v.), with which it is connected by rail, and on the edge of a fertile plain inhabited chiefly by immigrants from Kwang-tung, and producing good crops of rice, sugar, etc. The trade of the port is not very important, but there is a considerable export of sugar. Population, estimated at 7000.

TAKU, tä'ko͞o'. A village in the Province of Chi-li, Northern China, near the mouth of the Pei-ho, 30 miles east of Tien-tsin (Map: China, E 4). It is known for its strong fortifications, which were taken by the British and French fleets in 1858-60 and by the allied troops on June 17, 1900, during the Boxer uprising.

TALAING. See MONS.

TALAVERA DE LA REINA, tä'lȧ-vā'rȧ dȧ lȧ rā'ē-nȧ. A town of New Castile, Spain, in the modern Province of Toledo, 68 miles southwest of Madrid, on the Madrid-Valencia de Alcântara Railroad (Map: Spain, C 3). It is charmingly situated on the right bank of the Tagus, which is here spanned by a quarter-mile bridge of 35 arches. The town is in a fertile, well-watered valley. Its former silk-weaving industry is now fast disappearing, but the town contains important potteries, and cloth, hat, leather, soap, and varnish factories. Its population in 1900 was 9990. An important battle took place here July 27 and 28, 1809, in which Wellington defeated the French under Joseph Bonaparte, Jourdan, and Victor.

TALBOT. The name of an ancient breed of white dogs, also called 'old Southern hound,' from which have descended many of the modern breeds. The talbot probably derives its name from the ancient family of Talbot, whose coat of arms bears the figure of a dog. See HOUND.

TALBOT, tạl'bŭt, CHARLES, twelfth Earl and only Duke of Shrewsbury (1660-1718). An English statesman. He was the son of the eleventh Earl, his mother being the notorious Anna Maria Brudenell, the mistress of the Duke of Buckingham, who in a duel killed Charles's father. He was educated as a Roman Catholic, but after the 'Popish Plot' attached himself to the Anglican Church. Although a prominent official at the coronation of James II. in 1685 he was one of the seven noblemen who invited William, Prince of Orange, to England. He was active in securing the success of the Revolution, and was Secretary of State for the northern province from 1689 to 1690 and again in 1694, on the latter occasion being made a Knight of the Garter and created Marquis of Alton and Duke of Shrewsbury. In 1710 he was appointed Lord Chamberlain by Queen Anne, in 1712 Ambassador to France, and in 1713 Lord Lieutenant of Ireland. Two days before her death in 1714 the Queen appointed him Lord High Treasurer. Under George I. he became Lord Chàmberlain. His ducal title became extinct at his death in 1718.

TALBOT, JOHN, first Earl of Shrewsbury (c.1388-1453). An English general of Welsh descent. Henry V. appointed him Lord Lieutenant of Ireland in 1414, where he was engaged in subduing some of the septs and in other military operations. In 1419 he went to France and took an active part at the sieges of Melun and Meaux and in the battle of Verneuil. In 1424 he received the Order of the Garter, and again became Lord Lieutenant of Ireland under Henry VI. In 1427 he again returned to France, and after numerous successes in Brittany was taken prisoner at Patay in 1429 by Joan of Arc. The ransom demanded for his release was so high that he did not regain his freedom until 1433, and then by exchange. In 1442 he was created Earl of Shrewsbury, and in 1446 Earl of Waterford, Lord of Dungarvan, and Steward of Ireland. With the exception of an interval of rule in Ireland from 1445 to 1447, the rest of his life was spent in France, where he was distinguished for the audacity and daring of his military exploits, and where he was killed at the battle of Castillon in 1453.

TALBOT, John (1645-1727). One of the early Church of England missionaries in America. He was rector of Freetherne, but resigned his living to come to America with the first missionaries sent by the Society for the Propagation of the Gospel. He was the founder and first rector of Saint Mary's Church, Burlington, N. J., and labored diligently there and in other colonies. There is considerable evidence for believing that he was consecrated bishop by the Nonjurors (q.v.) in 1722, as well as Robert Welton, who for a time was rector of Christ Church, Philadelphia—sixty years before Seabury obtained consecration from the Scottish bishops. Talbot is said occasionally to have assumed the episcopal dress, and to have administered confirmation privately. Consult: Hills, *History of the Church in Burlington* (2d ed., Trenton, 1885); id., *John Talbot, the First Bishop of North America* (ib., 1878).

TALBOT, Richard, Duke and Earl of Tyrconnel. Viceroy of Ireland in the reign of James II. See Tyrconnel, Richard Talbot, Duke and Earl of.

TALBOT, Silas (1751-1813). An American naval officer, born in Dighton, Mass. He was engaged, as a boy, in the coasting service, and in June, 1775, after the outbreak of the Revolutionary War, entered the American Army as lieutenant, serving at Boston, and becoming a captain of infantry in January, 1776. At New York in 1776 he made an attempt, by means of a fire ship, to destroy a part of the English squadron in the harbor, and on October 7, 1777, Congress promoted him to the rank of major. He was wounded (October 23, 1777) at Fort Mifflin, served with gallantry at Butt's Hill (August 29, 1778), and on October 28, 1778, in command of a small sloop, captured off Newport the British blockading schooner *Pigot*. For this he was commissioned lieutenant-colonel by Congress on November 14th. He became a captain in the United States Navy September 17, 1779, and was directed to protect the Long Island coast and to keep General Gates's communications open. In May, while in command of the *Pigot* and the *Argo*, he captured the British schooner *Lively* and two privateers, and subsequently defeated and captured the *King George* and the *Dragon*, the latter after a four hours' battle. He was taken by the British in 1780 and treated with the utmost barbarity, being confined for a time in the prison-ship *Jersey* and then in the 'Old Sugar House,' and then being taken to England, where he was exchanged late in 1781. After the war he bought the confiscated estate of Sir William Johnson, and was a member of Congress from 1793 to 1794. The frigate *Constitution* (q.v.) was built under his supervision, and in 1799 was his flagship during a cruise in the West Indies. Owing to a dispute with Commodore Truxtun, concerning priority in rank, he resigned in 1801, and passed the rest of his life in New York. Consult Tuckerman, *The Life of Silas Talbot* (New York, 1850).

TALBOT, William Henry Fox (1800-77). An English photographer and philologist, well known as one of the inventors of photography. He was educated at Cambridge, received the junior chancellor's medal in 1821, and subsequently became member of Parliament for Chippenham. But soon afterwards he gave up politics, and devoted himself entirely to scientific investigation. The first problem to attract his attention was that of fixing shadows, and by patient research he was gradually led to the discovery of a process of obtaining and fixing sun-pictures. On the dissemination of a report as to Daguerre's successes in the same field, Talbot secured his just rights by publishing a paper (*Phil. Mag.*, March, 1839), in which the successive steps of his investigation and their result were detailed. This process was subsequently improved by his invention (1841) of the calotype process. His discoveries and inventions in photography are described in his *Pencil of Nature* (1844-46). Latterly he devoted himself to the study of philology and archæology, and was one of the first to read the cuneiform inscriptions of Nineveh. Among his works are: *Hermes, or Classical and Antiquarian Researches* (1828-39); *Illustrations of the Antiquity of the Book of Genesis* (1839); and a work on *English Etymologies* (1846). See Photography.

TALC (Fr. *talc*, Sp. *talco*, *talque*, from Ar. *ṭalq*, talc). A mineral hydrated magnesium silicate crystallized in the orthorhombic system. It has a pearly or semi-metallic lustre, is soft, and is silvery-white to gray or green in color. Talc seldom occurs in crystals, but is usually found in foliated or granular masses. It is an exceedingly common mineral and in some regions is found in large beds. The granular massive varieties are commonly known as soapstone and find extensive use in commerce as slabs for hearthstones, mantels, sinks, etc., and when powdered, as a pigment, in paper-making, as a lubricator, for dressing skins and leather, etc. The fine granular or crypto-crystalline varieties are used for marking purposes under the name of French chalk. In 1900 27,943 tons, valued at $383,541, were mined in the United States.

TALCA, täl′kȧ. A province of Chile, bounded by Argentina on the east and the Pacific on the west (Map: Chile, C 11). Its area is 3678 square miles. It is mountainous, with the Andes in the east and the lower coast range in the west, and the central portion is covered with plains interspersed with low hills. The mountains are well wooded and the interior is very fertile. Wheat is the chief agricultural product and grazing is carried on extensively. The province is crossed by the main railway line of Chile and has a branch line from the capital, Talca, to the coast. Population, in 1895, 128,961.

TALCA. The capital of the Chilean Province of Talca, on the left bank of the Calaro River, a tributary of the Maule, 140 miles south of Santiago on the Santiago-Concepción Railway, and 45 miles from the coast, with which it has railway connection (Map: Chile, C 11). Extremes in heat and cold render its climate disagreeable. The chief industry is the weaving of *ponchos* (woolen blankets). Population, in 1901 (estimated), 40,987.

TALCAHUÁNO, täl′kȧ-wä′nō. A seaport of Chile, on the Pacific coast, eight miles north of Concepción. The town is located on a peninsula which forms a very safe harbor, the entrance of which is protected by the island of Quiriquina. The harbor is equipped with a breakwater and an extensive system of docks. Wheat grown in the interior provinces of Santiago and Valdivia, with which the town has railway connection, is exported. Population, in 1900, 15,376. Talcahuano was founded as a military post in 1780 and was almost totally destroyed by an earthquake in 1835.

TALENT (Lat. *talentum*, from Gk. *τάλαντον*, *talanton*, talent, weight, balance; connected with *τλῆναι*, *tlĕnai*, to bear, Lat. *tollere*, to lift, Skt. *tulā*, balance). The maximum unit of weight and value among the Greeks; the equivalent of 60 minæ or 6000 drachmæ. In the Homeric poems the word is used in a different sense to signify a small weight of gold, apparently of no great value, since two talents are worth less than a handsome bronze caldron. While the name is Greek, the weight came from Babylonia and Phœnicia. Here a system of 60 shekels to a mina and 60 minæ to a talent was employed in early times, and in two forms, a 'common' and a 'royal,' the latter being about one-twentieth heavier than the common. Furthermore, both forms had a 'heavy' and a 'light' system, of which the latter was one-half the former. Moreover, in weighing gold, 50 shekels were reckoned to a mina, or 3000 instead of 3600 to a talent. For silver, again, a new standard was introduced, so arranged that while the ratio in value of silver to gold was 1 to 13½, the ratio of weight should be 1 to 10 (Babylonian) or 1 to 15 (Phœnician). The 'royal' forms seem also to have varied at different times. The Greeks, in borrowing these systems, naturally varied them somewhat, and we therefore find considerable variety among the different Greek States. It is obvious that a very slight variation in the weight of the shekel, or drachma, would make a large difference in the talent. Of the chief Greek systems the Æginetan is not exactly identical with any of these Eastern standards, but is perhaps connected with a Babylonian 'royal' form, and at any rate seems to have been adapted to their trade with Asia Minor. This talent weighed about 37.8 kilograms. The other common standard was the Euboic-Attic with a talent of about 26 kilograms, which has been usually connected with the common light Phœnician standard, though recent writers prefer to connect it with the Babylonian. In Athens this was used in reckoning money, while in the market a talent of about 37 kilograms was employed. The value of the Attic silver talent, which was not a coin, but a sum of money, was about $1080. Consult Hill, *Handbook of Greek and Roman Coins* (London, 1899).

TALE OF A TUB. (1) A comedy by Ben Jonson, licensed in May, 1633, and printed in folio in 1640. The first performance has been conjectured to have been given either in 1601 or in the winter of 1603-04. A revised version was produced in 1634. (2) A religious satire by Jonathan Swift, published anonymously in 1704. It deals with the various alterations which three brothers make in the coat which their father has bequeathed to them. Peter stands for the Roman Catholic Church, Martin for the Lutherans, and Jack (from John Calvin) for the extreme Protestants.

TALE OF TWO CITIES, A. An historical novel by Charles Dickens, first published in *All the Year Round*, April 30 to November 26, 1859, and immediately after in book form. Its scene is laid partly in London and partly in Paris during the French Revolution, of which it presents striking pictures. It is regarded as the most perfect in point of plot-construction of the author's works. See Defarge, Thérèse.

TALESMEN (from Lat. *tales*, nom. pl. of *talis*, such, from the initial word in the summons of the original Latin phrase *tales de circumstantibus*, such of the bystanders + Eng. *men*). Men called to supply a deficiency in the number of jurors in a panel. In some jurisdictions a list of competent men is kept by the proper officials for this purpose, and in many States, in an emergency, the court may call upon bystanders to fill the panel. Jurors thus summoned are called talesmen. See Jury.

TALES OF A GRANDFATHER. A collection of historical pictures by Sir Walter Scott, the first two series (1828-29) dealing with England, the third (1830) with Scotland, and the fourth (1830) with France. They are put in extremely simple and popular form, and were intended by the author for children.

TALES OF A TRAVELER. A series of sketches and stories by Washington Irving (London and New York, 1824), the scenes of which are laid in England and France. A large part of the *Tales* is taken up by the autobiography of an imaginary personage, Buckthorne, and an account of his friends and their adventures.

TALES OF A WAYSIDE INN. A collection of poetical narratives by Henry Wadsworth Longfellow, the first of which is entitled *The Challenge of Thor*, and was written in 1849; the last is entitled *The Rhyme of Sir Christopher*, and was written in 1873. The series was published in three parts, at Boston, in 1863, 1872, and 1873. The 'Wayside Inn' was an old tavern, the Howe Tavern, still standing in Sudbury, Mass.

TALES OF MY LANDLORD. The name given by Sir Walter Scott to four different sets of his novels. Their publication was begun in 1816 under the fictitious editorship of Jedediah Cleishbotham (q.v.). The first set contained *The Black Dwarf* and *Old Mortality;* the second (1818), *The Heart of Midlothian;* the third (1819), *The Bride of Lammermoor* and *The Legend of Montrose;* and the fourth (1832), *Count Robert of Paris* and *Castle Dangerous.*

TALES OF THE CRUSADERS. The name given by Sir Walter Scott to *The Betrothed* and *The Talisman* (1825).

TALES OF THE GENII. A series of Oriental stories, modeled on the *Arabian Nights*, by James Ridley, published in London in 1764.

TALFOURD, ta̤l′fẽrd, Sir Thomas Noon (1795-1854). An English lawyer and author, born at Reading, in Berkshire. He studied law with Joseph Chitty (q.v.), and was called to the bar at the Middle Temple (1821). He was eventually elected to the bench in the Court of Common Pleas (1849). His famous case was a defense of Edward Moxon, who was prosecuted for publishing Shelley's *Queen Mab*. Entering Parliament in 1835, he won great honor for his speech in favor of the copyright bill (1837), which he himself had introduced. In recognition of his service, *Pickwick* was dedicated to him. With Lamb his name is especially associated by *Letters of Charles Lamb with a Sketch of His Life* (1837) and *Final Memorials of Charles Lamb* (1848). In 1875 these two books were published together under the title *Memoirs of Charles Lamb*. They have since been edited by Percy Fitzgerald (London, 1892). Talfourd's great literary success was *Ion*, a tragedy performed by Macready (May 26, 1836). It was followed by *The Athenian Captive* (1838) and *Glencoe* (1840). Consult the *Tragedies* (Routledge's Pocket Library, London and New York, 1889); *Critical and Miscellaneous Writings* (Philadelphia, 1842); and *A Memoir of Mr. Justice Talfourd* (London, 1854).

TALIAFERRO, tŏl'ĭ-vẽr, WILLIAM BOOTH (1822-98). A Confederate soldier, born at Belleville, in Gloucester County, Va. He attended Harvard College, and then William and Mary College, where he graduated in 1841. At the beginning of the Civil War he was made a colonel in the Provisional Army of Virginia. He participated in most of the battles fought by the Army of Northern Virginia prior to March, 1863, and was promoted brigadier-general in March, 1862. In March, 1863, he was put in command of the district of Savannah, Ga. In the following July, at the time of the desperate attacks on Fort Wagner, he was in command of the defenses on Morris Island, and in August of those on James Island. In 1864 he commanded the Seventh Military District, comprising a part of South Carolina, and in December was given command of the entire State. He was promoted major-general January 1, 1865. After the war he resumed the practice of law, and served for ten years in the Virginia House of Delegates. He contributed "Jackson's Raid Around Pope" to *Battles and Leaders of the Civil War.*

TA-LIEN-WAN, tä'lĕn'wän'. A bay on the eastern coast of the Liao-tung Peninsula in Manchuria (Map: China, F 4). It is roomy and protected at the entrance by two islets. It is ice-free throughout the year. At its head lies the new Russian port Dalny (q.v.). Ta-lien-wan with the surrounding territory was leased to Russia in 1898.

TALIESIN, tăl'ĭ-sĭn. A British bard, who is supposed to have lived about the middle of the sixth century. Nothing definite is known as to his career, and some scholars hold that he is a mythical personage. According to legend he was called 'the chief of the bards.' The "Book of Taliesin" contains 56 poems, which were formerly attributed to Taliesin. All are now generally believed to be of a later date. Consult: Skene, *The Four Ancient Books of Wales* (2 vols., Edinburgh, 1868), in which the "Book of Taliesin" is included; for the legends, Guest, *Mabinogion* (2d ed., London, 1877).

TALIPES, tăl'ĭ-pēz. The technical term for club-foot (q.v.).

TALIPOT PALM (Hind. *tālpāt*, from Skt. *tālapatra*, palm-tree leaf, from *tāla*, palm-tree + *patra*, leaf), GREAT FAN PALM (*Corypha umbraculifera*). The noblest palm of the East Indies, a native of Ceylon, Malabar, etc. Its straight cylindrical trunk, 60 to 100 feet high, is crowned with a tuft of enormous palmate plaited leaves, divided near the outer margin into numerous segments, and united to the trunk by spiny leafstalks. The leaves are usually about 8 or 10 feet long, exclusive of the leafstalk, which is 7 or 8 feet long. At the age of thirty or forty years the tree produces a long pyramidal cluster of whitish flowers rising to the height of 30 feet from the midst of its crown of leaves, and dividing into simple alternate branches, the lower of which sometimes extends laterally 20 feet. After maturing the numerous globose fruits about an inch and one-half in diameter the tree generally dies. The leaves are used for covering houses, for making tents, and for many other purposes. The leaves of this palm are used in Malabar for writing upon, characters being traced upon them with an iron style. They are prepared for this purpose by boiling, drying, damping, rubbing, and pressing. The soft central part of the stem, like that of many other palms, yields a kind of sago.

TALISAY, tä'lê-sī'. A town of Cebú, Philippines, situated 6 miles southwest from Cebú (Map: Philippine Islands, H 9). Population, in 1887, 16,055; now 19,000.

TALISMAN (Sp., Port. *talisman*, from Ar. *tilsam*, *tulsam*, *tilism*, pl. *tilsamān*, talisman, from Gk. *τέλεσμα*, *telesma*, consecrated object, talisman, religious rite, completion, from *τελεῖν*, *telein*, to end, to make perfect, from *τέλος*, *telos*, end). In its strict sense, a species of charm, consisting of a figure engraved on metal or stone when two planets are in conjunction, or when a star is at its culminating point, and supposed to exert some protective influence over the wearer of it by keeping away diseases or bringing luck. While the proper distinctive character of the talisman thus resides in its astrological character, in common usage the terms talisman and amulet (q.v.) are synonymous, referring to any object used as a charm against evil spirits or evil influences. Consult Elworthy, *The Evil Eye* (London, 1895).

TALISMAN, THE. A novel by Sir Walter Scott, published, with *The Betrothed*, in June, 1825. The action takes place in Palestine, during the Crusades. The title of the story is derived from an amulet or charmed stone with which Saladin cures King Richard Cœur de Lion in his illness and which he afterwards presents to the hero, Sir Kenneth, finally discovered to be the Prince Royal of Scotland, on his marriage with Edith, the sister of Richard.

TAL'LADE'GA. The county-seat of Talladega County, Ala., 60 miles east of Birmingham; on the Southern and the Louisville and Nashville railroads (Map: Alabama, C 2). It is the seat of State schools for the deaf, dumb, and blind; of Talladega College (Congregational), an institution for colored students; and of a Presbyterian Orphans' Home. Talladega has considerable industrial importance. There are cotton mills, a cottonseed-oil mill, an iron furnace, and manufactories of hosiery and fertilizers. Under the charter of 1901 the government is vested in a mayor, elected biennially, and a unicameral council. The water-works and the gas plant are owned and operated by the municipality. On the site of Talladega, General Jackson, at the head of 2000 men, defeated a force of 1000 Creek Indians on November 9, 1813, the Indians losing about 300, and the Americans, 15 killed and 86 wounded. Population, in 1890, 2063; in 1900, 5056.

TAL'LAHAS'SEE. The capital of Florida, and the county seat of Leon County, 165 miles west of Jacksonville; on the Seaboard Air Line, the Carrabelle, Tallahassee and Georgia, and the

Georgia, Florida and Alabama railroads (Map: Florida, D 1). It is finely situated on an eminence, in the vicinity of several picturesque lakes, and has wide, beautifully shaded streets. The Florida State College, occupying a site overlooking the city, the Florida State Normal and Industrial College for Colored Students, and the Leon County Academy are the leading educational institutions. The State Library has 9500 volumes; and there are also in the city the Supreme Court Library, with more than 7000 volumes, and the David S. Walker Library (formerly the University Library), with 6000 volumes. Other prominent features are the State Capitol, the court-house, the post-office, and Bloxham Park. The vicinity is especially adapted to the production of cotton, tobacco, and sugarcane, and also has important dairying and stock-raising interests. Cottonseed oil and cigars constitute the principal manufactures. The government, under the revised charter of 1869, is vested in a mayor, chosen annually, and a unicameral council. Tallahassee was laid out in 1824 on a site selected two years earlier as the seat of the Territorial Government, and was incorporated as a city in 1827. Population, in 1890, 2934; in 1900, 2981.

TALLEMANT DES RÉAUX, tȧl'mäN' dȧ rȧ'ō', GÉDÉON (1619-92). A French writer, born at La Rochelle, and connected through his mother with the famous Rambouillet family. He took his degrees in law, but refused to fulfill his father's wish that he should go into the magistracy. He employed his leisure in literary work, wrote verses in the taste of the time, and began a tragedy of *Œdipe*. But he is chiefly remembered by his *Historiettes*, a series of biographical, anecdotal, and character sketches of contemporary personages. Light, witty, somewhat cynical, and usually less restrained than modern taste demands, they are an invaluable document of the period, and particularly of the Hôtel de Rambouillet. They have been collected by Monmerqué, Levavasseur (1840), and Techener (1860). Tallement also began the *Mémoires de la Régence d'Anne d'Austriche*, intended to throw light upon the administration of Cardinal Mazarin. These, however, have not come down to us.

TALLEYRAND-PÉRIGORD, tȧ'lȧ'räN'pȧ'rā'gôr', CHARLES MAURICE, Duke de, Prince of Benevento (1754-1838). A French statesman, born in Paris. His father was an officer in the French Army, and fought through the Seven Years' War. Charles Maurice was the eldest son; on account of an accident in infancy which rendered him lame for life, he was trained for the Church at Saint Sulpice, the Sorbonne, and Rheims. He showed brilliant talents, but neither moral purpose nor a calling for the Church. He obtained, however, several ecclesiastical benefices, among them the abbacy of Saint Denis, in the diocese of Rheims (1775), in the year of his ordination. Appointed agent-general for the clergy in 1780, a lucrative and important post which brought him into close connection with the Government, he began a serious apprenticeship in public business, leading at the same time a notoriously licentious life. In 1788 his administrative abilities secured for him the bishopric of Autun. As representative of his diocese in the States-General of 1789, he favored uniting with the Third Estate, and thus won the good will of the popular party. He was appointed one of the commission to draw up a constitution for the nation. He assisted in framing the Declaration of Rights; proposed, October 10, 1789, the confiscation of Church property as belonging of right to the nation; and on February 16, 1790, he became president of the National Assembly. He was among the first of his order to take the oath to obey the Constitution, and urged the clergy of his diocese to follow his example. Excommunicated by the Pope, he was compelled to resign his bishopric. In January, 1792, Talleyrand was sent to London in a semi-official capacity, the object of his mission being to conciliate England. It was, however, suspected that he was a person 'disposed to serve the King,' and he was put on the list of *émigrés*. He remained in England until January, 1794, then spent more than a year in the United States, and after the fall of the Terrorists procured the revocation of his banishment, and in March, 1796, reëntered Paris, having paved the way for a favorable reception by a series of the most adroit and judicious intrigues. He attached himself to the group of constitutionalists and in 1797, mainly through the influence of Mme. de Staël, was named Minister of Foreign Affairs.

With his usual shrewdness Talleyrand saw the significance of the rise of Napoleon Bonaparte, attached himself to the fortunes of the young Corsican, and became his ally and confidant in the coup of the 18th Brumaire, which resulted in the overthrow of the Directory. After this Talleyrand, who had been reappointed Minister of Foreign Affairs by Bonaparte, directed his whole effort toward consolidating the power and authority of his master. In the diplomatic negotiations that followed the victories of France under the Consulate he had the principal part; he was the prime mover in the seizure and execution of the Duke d'Enghien, and assisted in the establishment of the Empire and in the organization of the Confederation of the Rhine. For these services he was made Prince of Benevento in 1806. He opposed Napoleon's disastrous policy with regard to England, and soon after Tilsit (1807) laid down his office as Foreign Minister, and after some intriguing retired from active life (1809), residing on his estates, and preparing for the turn of the tide. When after the French disasters of 1812 Europe rose against Napoleon Talleyrand became the centre of a group of malcontents, whose influence grew with the advance of the allied armies, and finally communications were opened with the Bourbons. Talleyrand dictated to the Senate the terms of the deposition of Napoleon; and on the restoration of the Bourbons he became Minister of Foreign Affairs in the first Government of Louis XVIII. He represented France at the Congress of Vienna and played there a game of masterly politics, working on the jealousies of the powers, and by appealing to the principle of legitimacy gaining solid advantages for France. He had succeeded in bringing about a secret alliance between Austria, Great Britain, and France against Russia and Prussia when Napoleon's return from Elba shattered his plans. Henceforth he had little part in public affairs. He resumed the office of Foreign Minister in May, 1814, after the restoration, but soon resigned, owing to the hostility of the old nobility.

After the July Revolution Louis Philippe employed him as Ambassador at the English Court, where he contrived to bring about a friendly feeling between the new monarchy and the English Government, and negotiated the Quadruple Alliance of 1834 between France, Great Britain, Spain, and Portugal. He returned to France in 1835, and died at Valençay, May 17, 1838. Talleyrand stands out preëminently as the type of the unscrupulous diplomat and politician. A skeptic in religion and a cynic in morals, he possessed a remarkable insight into the grosser nature of man and almost unexampled adroitness for playing on the lower motives. He had a rare talent for caustic epigram, and his disillusioned view of human nature is attested by numerous witty sayings which have become part of the world's narrower wisdom.

The *Mémoires* of a man of Talleyrand's keen perceptions and close contact with great events necessarily have considerable historical value. His plan was to have them published thirty years after his death, but at that time it was decided to postpone their publication, and they were finally issued in five volumes (Paris) in 1889-91. Consult, in addition to general works on the period: Bastide, *Vie religieuse et politique de Talleyrand* (Paris, 1838); *Correspondance du prince de Talleyrand et du roi Louis XVIII. pendant le congrès de Vienne* (ib., 1881); Sorel, *Essais d'histoire et de critique—Talleyrand au congrès de Vienne* (ib., 1883); Sainte-Beuve, "Talleyrand," in *Nouveaux Lundis*, vol. xii. (ib., 1872).

TALLIEN, ta'lyäN', Jean Lambert (1769-1820). A French revolutionary leader, born in Paris. He was educated by his father's employer, the Marquis de Bercy. He early imbibed the spirit of the Revolution, was attached to the *Moniteur*, and started a journal, *L'Ami des Citoyens*, in imitation of Marat's *Ami du Peuple*. He acquired great influence with the people and became a leader in extreme and sanguinary measures. On August 10, 1792, he was made secretary to the Revolutionary Commune of Paris, was later chosen to the Convention and there became the apologist of Marat, voted for the death of Louis XVI., and was eager for the destruction of the Girondists (q.v.). Toward the close of 1793 he was sent to Bordeaux as the representative of the Committee of Public Safety. A passion which he there conceived for Madame de Fontenay, whom he married December 26, 1794, made him amenable to her influence, which was exerted on the side of clemency. On March 22, 1794, he was chosen president of the Convention. Robespierre, who hated him, and felt that he could not be trusted, denounced him in the Convention. Tallien recognized his danger and dexterously rallied the remnants of the Dantonists, Hébertists, and other factions against the Government of Robespierre, Saint Just, and Couthon, and brought about the events of the 9th Thermidor (July 27, 1794), which caused the fall of the triumvirate. Tallien became head of the Committee of Public Safety, lent his aid in suppressing the Revolutionary Tribunal and the Jacobin Club, and drew up the accusations against Carrier, Le Bon, and others of the Terrorists. From 1795 to 1798 he was a member of the Council of Five Hundred, where, however, his influence rapidly diminished. He accompanied Bonaparte to Egypt, editing the official journal, *Décade Egyptienne*, and, when returning to France, was captured by an English cruiser, and taken to England, where he was lionized by the Whigs (1801). Soon after he returned to France, and was sent in 1805 as consul to Alicante. He died in Paris, November 16, 1820. Under the Directory Madame Tallien's salon was one of the most brilliant in Paris. While Tallien was absent in Egypt, she was divorced from him and married in 1805 Count de Caraman, afterwards Prince de Chimay. See Chimay, Jeanne Marie Ignace Thérèse de Cabarrus, Princess de.

TAL'LIS, Thomas (c.1510-85). A famous English organist and composer. He achieved great proficiency in organ-playing, and was organist at Waltham Abbey for many years. About 1542 he was appointed gentleman of the Chapel Royal, and served under Henry VIII., Edward VI., and the queens Mary and Elizabeth. He was also organist to Elizabeth. In 1575-76 he obtained, with William Byrd, letters patent, giving the exclusive right, for twenty-one years, of printing music and ruled music paper. The first work printed under this patent was their *Cantiones quæ ab Argumento Sacræ Vocantur Quinque et Sex Partium* (London, 1575), containing 34 motets, by Tallis and Byrd, the work being a beautiful specimen of typography. About this time he composed his famous song of 40 parts, originally written to Latin words, but adapted to English about 1630. Tallis's compositions consist of Church music, *Order of Daily Service; Full Cathedral Service; Order for Morning Prayer, with the Litany Noted* (all of which have been edited in this century); Te Deums, chants, hymns, motets, and responses. His manuscripts are in the Oxford and Cambridge University libraries, and in the British Museum.

TALL'MADGE, Benjamin (1754-1835). An American soldier, born in Brookhaven, N. Y. He graduated at Yale in 1773; taught school at Wethersfield, Conn., for three years; and in June, 1776, became lieutenant and adjutant of a Connecticut regiment, rising to the rank of captain in December, 1776, and of major in April, 1777. On September 5, 1779, without the loss of a single man, he surprised and captured 500 Tory marauders at Lloyd's Neck, L. I., and in May, 1780, captured Fort George at Oyster Bay. He was present, besides, at the battles of Brandywine, Germantown, and Monmouth, had the custody of Major André until that officer's execution, and served at Washington's headquarters in 1781-83. After the war he became a successful merchant at Litchfield, Conn. His *Memoirs* were printed privately by his son in 1859.

TALLMADGE, Nathaniel Pitcher (1795-1864). An American legislator and governor, born in Chatham, N. Y. He graduated at Union College in 1815, and in 1818 was admitted to the bar. He was elected to the lower branch of the State Legislature in 1828 and to the State Senate in 1830. In the latter body he served until 1833, when he was elected to the United States Senate as a Democrat. Afterwards he allied himself with the Whigs and served by reëlection until 1844, when he resigned to accept the appointment of Territorial Governor of Wisconsin tendered him by President Tyler, and served until removed by President Polk in 1846.

TALLOW (MDutch *talgh, talch,* Dutch *talk,* LG. *talg,* Ger. *Talg,* tallow; possibly connected with AS. *tælg,* color, Goth. *tulgus,* fast, firm, and ultimately with Eng. *long*). A mixture of stearin, palmitin, and olein (qq.v.) derived from animal fat in the process of rendering. This fat is generally obtained from beef or mutton by melting and separation by heat, usually under pressure. Tallow is a white and almost tasteless substance in its pure condition, but the commercial article is usually of a yellowish color. It is soluble in boiling alcohol and has a specific gravity which varies from .925 in the case of beef tallow to .937 in the case of mutton tallow. It melts between 100° and 120° F. Tallow is employed in making candles (q.v.) and soap. It may also be used as a lubricant. See Fats.

TALLOW, Mineral. See Mineral Tallow.

TALLOW TREE. Various trees which produce a thick oil or a somewhat resinous substance, which, like tallow, may be used for making candles. The tallow tree of Malabar (*Vateria indica*), a tree of the natural order Dipterocarpaceæ, has leathery leaves 4 to 10 feet long, and panicles of white, fragrant flowers. From incisions in the stem, which is often 16 feet in circumference, east Indian copal is obtained. Its seeds yield a firm, white, odorless vegetable tallow valued for soap and candle making. The tallow tree of China (*Sapium sebiferum*) belongs to the natural order Euphorbiaceæ. The nearly hemispherical seed and the capsules yield a white vegetable tallow, which the Chinese obtain by crushing and boiling both capsules and seed and skimming off the fluid fat. Three parts wax is added to ten of tallow to give a firmer consistency. This tree has been introduced into North America, is cultivated about Charleston and Savannah, and is almost naturalized in the maritime parts of the Carolinas. It is very beautiful at the approach of winter, when the leaves become bright red, among which hang the white seeds suspended by threads. The name tallow tree is sometimes given to *Aleurites triloba,* a species of candlenut (q.v.). The tallow tree, or butter-and-tallow tree, of Sierra Leone is *Pentadesma butyracea,* of the natural order Guttiferæ, the fruit of which furnishes an oil used as butter.

TALLY (OF., Fr. *taille,* cut, size, figure, tax, from Lat. *talea,* rod, cutting twig). The name given to the notched sticks once used in England for keeping accounts in Exchequer. They were well seasoned rods of hazel or willow, inscribed on one side with notches indicating the sum for which the tally was an acknowledgment, and on two opposite sides with the same sum in Roman characters, along with the name of the payer and the date of the transaction. The tally was cleft through the middle by the deputy chamberlain with knife and mallet, and one half was retained by the payer as his receipt, while the other was preserved in Exchequer. They accumulated there until 1834, when an act of Parliament ordered them to be burned. The destruction of the houses of Parliament by fire at the time is supposed to have arisen from the overheating of the flues in which the discarded tallies were being burned.

TALMA, tȧl'mȧ', François Joseph (1763-1826). A distinguished French tragedian, born in Paris. In 1787 he made his début on the stage of the Comédie Française. Some time afterwards in a minor part in the tragedy of *Brutus* he attracted attention by a novelty of costume. It was the fashion for actors to appear in the garb of their own country and even their own time, and Roman senators stalked about the stage attired as Parisian dandies of the eighteenth century. Talma saw the absurdity of the custom and, setting out to reform it, appeared clothed in a Roman toga and with arms bare. His first great triumph was in Chénier's *Charles IX.,* produced in 1789. In the division of the Comédie Française (q.v.) which soon followed in the months of Revolutionary confusion, Talma and those who adhered to him went over to the new theatre in the Rue Richelieu, which was for a time known as the Théâtre de la République. There many of his greatest successes were won. Though irritable and often at strife with his fellow actors, he was a great favorite with Napoleon, of whom it was jestingly said that he took lessons of his friend Talma in the art of behaving like an Emperor. Talma was, however, equally well received later by Louis XVIII. Consult his "Quelques réflexions sur Lekain et sur l'art théâtral," prefixed to the *Mémoires de Lekain* (Paris, 1825); *Mémoires de Talma,* ed. by Alexander Dumas (1849-50); Lumière, *Le Théâtre Français pendant la Révolution, avec plusieurs lettres inédites de Talma* (Paris, 1894).

TAL'MAGE, Thomas De Witt (1832-1902). An American clergyman and pulpit orator, born at Bound Brook, N. J. After taking a partial course at the University of the City of New York (now New York University) he entered the theological seminary of the Dutch Reformed Church at New Brunswick, N. J., where he graduated in 1856. In the same year he was ordained and became pastor of the Reformed Church at Belleville, N. J. He filled pastorates in churches of the same denomination at Syracuse, N. Y. (1859-62), and at Philadelphia (1862-69). In 1869 he was called to the pulpit of the Central Presbyterian Church of Brooklyn, N. Y., which, from the new edifice erected in 1870, came to be known as 'The Tabernacle.' During his occupancy of this pastorate, where he remained until 1894, he became widely known as a sensational preacher. The Tabernacle Church, after being twice burned and rebuilt (in 1872 and 1889), was again burned in 1894, after which the church organization ceased to exist. Dr. Talmage preached for a time in the New York Academy of Music, and from 1895 to 1899 was associate pastor of the First Presbyterian Church of Washington, D. C. His wide influence was largely increased by frequent lecturing tours, both in America and England, and by the publication of his sermons in book form, and through syndicates in more than 3600 weekly newspapers, in the United States, Canada, and Great Britain. They were also regularly translated, and published in a number of foreign languages. He was editor of *The Christian at Work* (1873-76); *The Advance* (1877-78); *Frank Leslie's Sunday Magazine* (1879-89); and *The Christian Herald* (1890-1902). Of the more than fifty volumes published under his name, a majority were pirated or unauthorized. Among his more important works were: *The Almond Tree in Blossom* (1870); *Old Wells Dug Out* (1874); *Every Day Religion* (1875); *Woman: Her Powers and Privi-*

leges (1886); *From the Pyramids to the Metropolis* (1892); *From Manger to Throne* (1894); *The Earth Girdled* (1895); and *The Pathway of Life* (1895). Dr. Talmage's sermons were written in a popular vein and were characterized by extravagant statements and fantastic figures of speech. For his life and work consult Adams (Chicago, 1902).

TALMUD (Aram. *talmūd*, instruction; connected with Heb. *lāmad*, to learn). The name given to the comprehensive compilation of laws and ceremonial regulations pertaining to Rabbinical Judaism together with the elaborate discussion of those laws and regulations. As already implied in this definition, the Talmud consists of two divisions, which in the compilation are kept distinct: (1) the laws and regulations which are technically comprised under the designation *Mishnā* (literally, teaching, then used concretely for 'the law,' as that which is taught or which is the outcome of teaching); (2) the discussion and elaboration of the laws, comprised under the term *Gĕmārā* (literally, 'supplement,' 'completion,' and then also in the sense of 'tradition,' 'doctrine'). The language of the Mishna is Hebrew; that of the Gemara Aramaic, which both in Palestine and Babylonia drove out Hebrew as the popular speech.

Of these two divisions, the compilation of the Mishna comes first in the order of time and also in importance. In its present form it consists of six main divisions known as *Sĕdārim*, comprising 63 treatises or *Massektōth*. This comprehensive compilation, which is attributed to Rabbi Jehuda ha-Nasi (c.219 A.D.) represents the close of an intellectual and religious process that may be said to date from the acceptance of the 'Priestly Code' through Ezra and Nehemiah in B.C. 444 as the supreme and sole standard of religious observances and secular regulations. The acceptance of this code definitely established obedience to a law for which divine origin was claimed as the test for fidelity to Yahweh. The observer of the law was the only type of the faithful Jew possible under this conception of religious duty. Such a principle necessarily led to the study of the law as the highest vocation of the individual. The law could not be observed unless it was known and thoroughly understood, and generations of scholars arose who strove to determine the exact meaning of the enactments in the codes and to account for numerous existing practices not specifically recorded in them, by deduction from principles underlying the code itself. The attempts to deduce the established religious practices and the constantly growing ceremonial details from the law itself resulted naturally in the formation of smaller and larger collections, which may have served either as notes for the pupils or as guides for the teachers, and despite a certain opposition that always manifested itself against committing to writing the large body of oral tradition, which, according to the theory of Rabbinic theology, was revealed simultaneously with the written law at Sinai, it was inevitable, if the practices established by or based upon this oral tradition were to maintain their hold as ingredient parts of Judaism, that they should be given a fixed form equally with the 'written' law. We have direct evidence for the existence of 'Mishnaic' compilations prior to the days of Rabbi Jehuda ha-Nasi, but the general acceptance which his compilation met naturally drove the earlier (and probably more incomplete) ones out of the field. Traces of these are to be found in the supplement to the Mishna, where enactments and observations are referred to which differ from those found in the Mishna; they are designated as the *Bāraythā* (i.e. outside). Another collection of this kind is known as the *Tōsephtā* ('addition'), which, however, partakes of the character of the Gemara.

Passing on to the supplement to the Mishna, its rise represents the natural continuation of the process which led to the Mishna. In the course of several centuries there was a large accumulation of material that could only be preserved by being committed to writing. The combination of the Mishna with the Gemara forms the Talmud proper, and for the Babylonian schools the first authoritative compilation of the discussions of the several generations was made by Rab Ashi, the head of the school at Sura, who flourished from 375 to 427; but additions were made by later authorities, such as Rab-Abina, and the final touches were given to it about the first half of the sixth century. In a certain sense, however, the Gemara was never finished, for of the 63 treatises of the Mishna, 26 have no Gemara. The Palestinian schools also compiled their discussions, and in this compilation the influence of Rabbi Jochanan (189-279), head of the school at Tiberias, is paramount, though the redaction of the Palestinian Talmud—the work of a series of authorities—did not take place until the fourth century, while additions continued to be made to it in the fifth century. Considerable portions of this Palestinian Talmud are lost. In fact, the Mishna of only the first four Sedarim or divisions has been preserved, and a portion of one treatise in the sixth division. In the second division the Gemara is not complete, four chapters of one treatise being wanting, and likewise in the fifth division the Gemara is lacking to the last chapter of one treatise and to two other treatises. That the Palestinian Talmud once existed in a more complete form is certain and it is more than likely that there was a Gemara to most of the treatises of the entire six divisions. The loss of such a considerable portion is due in part to the almost constantly disturbed conditions that prevailed in Palestine, and in part to the subsequent neglect of the Palestinian Talmud, which never acquired the authority that came to be enjoyed by the Babylonian compilation. The Babylonian Gemara in fact drove its rival entirely out of the field, and as a consequence the Babylonian Talmud became the main factor in the history and development of Judaism.

To characterize and convey an idea of the contents of the Mishna is a comparatively simple matter, but it is almost an impossible task to indicate the heterogeneous character of the Gemara, more particularly of the Babylonian Talmud. The discussions on the Mishna led the Rabbis and their pupils far away from the subject, at times, indeed, a section coming to a close without a return to the starting point. In the course of these digressions, anecdotes, bits of historical gossip, folk-lore, the popular science of the day, and mathematical calculations are intermixed with sober and playful exegesis of the Old Testament by the application of a series of hermeneutical principles evolved in the schools of Palestine and

Babylonia. Sophistry and hair-splitting dialectics are suddenly interrupted by charming parables and poetic allegories. In a sense, it is easier to say what the Gemara does not contain than to summarize its contents. It is a veritable encyclopædia of Rabbinical knowledge, and only the lack of system prevents the justifiable application of that term to this remarkable compilation. To distinguish the purely legal from the extraneous material, a division is commonly made into Halacha (lit., norm) and Hagada (lit., tale).

The history of the Talmud is the history of Judaism from about the beginning of our era to the dawn of the nineteenth century. In that history we may distinguish the following periods: (1) To the completion of the Mishna, during which time the Rabbis bear the name of *Tana'im* ('teachers'); five generations are enumerated. (2) The growth of the Gemara, the Rabbis of this second period being known as *Amoraim* ('speakers'), comprising seven generations. (3) To the completion of the Talmud, the Rabbis of this period being distinguished as *Saboraim* ('examiners'). (4) To the struggle in the ninth and tenth centuries between the Karaites and the adherents of the Talmud known as the Rabbanites, marked by the labors of Saadia (q.v.). (5) The adjustment of Talmudical Judaism to the prevailing form of Aristotelianism, which arose under the influence of Islamic theology. This period extends well into the thirteenth century and is dominated by the influence of Maimonides and the Spanish school of Jewish thinkers. It led eventually, after a long conflict between the adherents and opponents of Maimonides's attempt to codify the Talmudical enactments and regulations in systematic form, to the compilations of the codes of Joseph Karo (born 1487), known as the *Shulchan Aruch* ('Spread table'), which became the standard guide implicitly followed by orthodox Jews to the present time, and may be regarded as marking a sixth and final period.

In the course of the last two periods the study of the Talmud spread gradually into Southern Europe and thence made its way into Germany, Galicia, Hungary, and Russia. Commentators arose who devoted themselves to the interpretation of the Gemara, much as the Amoraim and Saboraim elaborated the Mishna and super-commentaries were added to these commentaries. The most notable of the Talmudical commentators was Rabbi Solomon Yishaki (or Isaac), known as Rashi (q.v.), whose work, almost invariably added to the Talmudic text, is still used as the basis of Talmudical study. A school of Talmudists arose in Germany and France during the twelfth and thirteenth centuries known as *Tosaphists* ('Supplementers'), whose comments are likewise written on the margins of the Talmud—a method that follows the example of the Mohammedan theologians. Other commentators of more recent date whose works acquired a high degree of authority were Solomon Luria (d. 1573), Elijah Wilna (d. 1797), and Akiba Eger (d. 1837). From Germany, which remained for several centuries the centre of Talmudical study, that centre gradually shifted to the east of Europe, and at the present time the traditional methods of Talmudical study are still carried on with vigor in Galicia and Russia, while the centre of the scientific study of the Talmud based on adequate philological acquirements and the application of proper historical principles may be said to be Germany, whence the study is spreading into France, England, and the United States, as the value of the Talmud for the student of language, of history, and of religion is coming to be recognized. Christian theologians are also beginning to take it up, and notable contributions have been made by some of these.

BIBLIOGRAPHY. No critical edition of the entire Talmud has as yet been published. The variant readings gathered from manuscripts and older editions have been published by Raphael Rabbinovicz, *Sefer Dikduke Sopherim* (15 vols., Munich, 1868-86), which constitutes the basis for a future standard edition. Of translations of the Talmud into modern languages, it will be sufficient to mention here the French translation of the Palestinian Talmud by Moïse Schwab (7 vols., Paris, 1871), the German translation of the Babylonian Talmud by L. Goldschmidt (Berlin, 1896 sqq.), and the English translation of the Babylonian Talmud by Rodkinson (New York, 1896 sqq.). An English translation of 18 treatises of the Mishna by J. Barclay was published in London in 1878. Of general works on the Talmud, the following may be mentioned: I. Hamburger, *Realencyklopädie für Bibel und Talmud* (Leipzig, 1886); Ferd. Weber, *Jüdische Theologie auf Grund des Talmud* (ib., 1897). Of monographs or articles on the Talmud, consult: Deutsch, "The Talmud," in *Literary Remains*, republished by the American Jewish Publication Society (Philadelphia, 1897); Arsène Darmesteter, *The Talmud* (Eng. trans., Philadelphia, 1897); Bernfeld, *Der Talmud, sein Wesen, seine Bedeutung und seine Geschichte* (Berlin, 1900); Strack, *Einleitung in den Talmud* (3d ed., Leipzig, 1901), which contains in concise form the contents of the Talmud, editions, history, and a valuable bibliography. Consult also Mielziner, *Introduction to the Talmud* (2d ed., New York, 1902); Rodkinson, *History of the Talmud* (New York, 1903). See GEMARA; HAGGADA; HALACHA; MISHNA.

TALON, tȧ'lôɴ', JEAN BAPTISTE (1625-91). A French official in Canada, born in Picardy. He entered the civil service, and, after serving in subordinate capacities in France, was appointed in 1663 intendant of justice, police, and finance in Canada, Arcadia, and the other French possessions in North America. Talon built ships, began trade with the West Indies, and built a brewery to lessen the consumption of brandy. Exploring parties were sent to Hudson Bay and to the country of the Upper Lakes, and the purchase or seizure of New York was urged. In 1668 he returned to France on account of failing health, but returned in 1670 and remained until 1672. Later three of his seigniories were erected into baronies and he assumed the title of Comte d'Orsainville. His *Mémoire à la majesté sur l'état présent du Canada* (1667) is a valuable original source of information.

TALTAL, tȧl-täl'. A town of the Province of Antofagasta, Chile, on the Bay of Taltal, Pacific Ocean, 527 miles north of Valparaiso (Map: Chile, C 9). It is the terminus of the railway of some 95 miles running to the mining town of Cachinal, and is the point of export for the nitre-beds and silver and copper mines of the deserts of Atacama (q.v.). Taltal was founded about 1855. Population, in 1885, 4761.

TALUS (Lat., heel). The heap of fragments that accumulates at the base of cliffs and mountain slopes. Weathering is the most important process in the production of such masses, which tend to move slowly downward until they come within reach of the valley stream. The inclination of the surface of the talus varies with the size of the fragments, but it rarely exceeds an angle of 35° with the horizontal.

TA'LUS. The squire of Artegal in Spenser's *Faerie Queene*. He is made of iron, and with his 'destroying flail' overthrows giants and annihilates 'rascal routs.' The figure is suggested by Greek legend, but symbolizes the contemporary exploits of Lord Grey, himself represented by Artegal in the allegory, during the Irish rebellion.

TAL'VI. See ROBINSON, THERESE ALBERTINE LUISE.

TAMANACA, tä'mȧ-nä'kȧ. A tribe of Cariban stock (q.v.) who formerly lived on the Cuchivero River, a southern affluent of the Orinoco, Central Venezuela. They were at one time one of the most powerful tribes of Venezuela and were Christianized and gathered into mission villages by the Spanish missionaries before the year 1780, but by the incessant attacks of the savage Carib (q.v.) they were so utterly wasted that before the year 1840 the name had disappeared, and they are supposed to be entirely extinct.

TAMAN'DUA. See ANT-EATER.

TAMAQUA, tȧ-mạ'kwȧ. A borough in Schuylkill County, Pa., 17 miles northeast of Pottsville, on the Little Schuylkill River, and on the Philadelphia and Reading and the Central of New Jersey railroads, being the western terminus of the latter, and the headquarters of a division of the former (Map: Pennsylvania, F 3). It is known for its extensive coal-mining interests, and has considerable industrial importance. The leading manufactures are foundry and machine-shop products, stoves, powder, flour, shoes, furniture, knit goods, and beer. The water-works are owned by the municipality. Tamaqua was settled in 1799, was incorporated as a town in 1832, and was chartered as a borough in 1852. Population, in 1890, 6054; in 1900, 7267.

TAMAR, tä'mär. A picturesque river which rises in the north of Cornwall, England, and after a southeast course of 60 miles enters the English Channel by its estuary the Hamoaze, at Plymouth (Map: England, B 6). It forms the boundary of the counties of Cornwall and Devon for 45 miles, and is navigable as far as Launceston. Consult Bray, *The Tamar and the Tavy* (London, 1879).

TAMARACK (North American Indian name), *Larix Americana*. An American timber tree common in swamps, valued for posts, poles, ties, etc. It is less ornamental than its close relative, the European larch, which is more frequently planted. See LARCH.

TAMARAO, tä'mȧ-rä'ȯ (native name). A small, sturdily built native buffalo (*Bos Mindorensis*) of the Philippines. It is about 3½ feet high at the shoulders, is clothed with thick brown hair, and has short, triangular, massive horns, which have a lyrate curvature upward from the face. Compare BUFFALO.

TAMARIN. See MARMOSET.

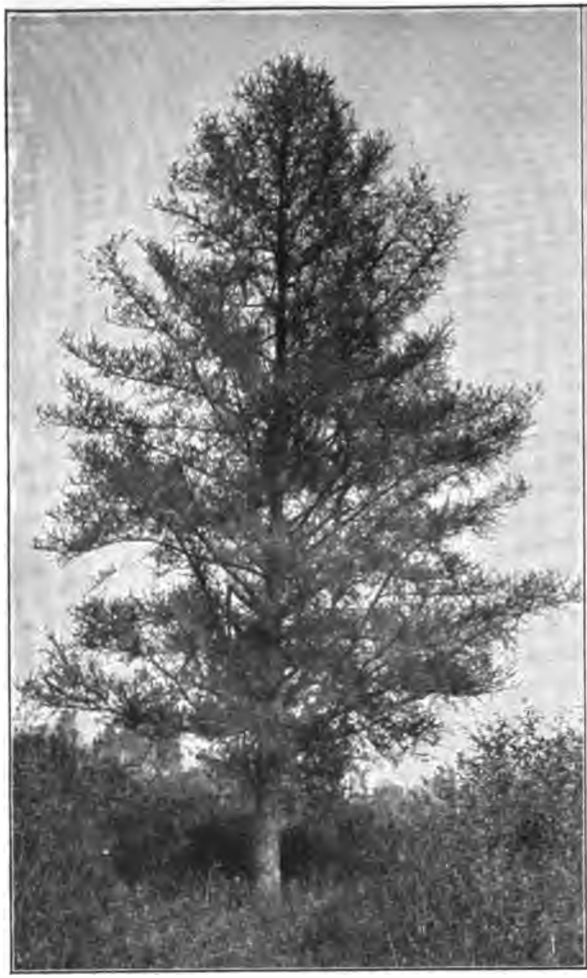
TAMARIND (ML. *tamarindus*, from Ar. *tamr Hindi*, *tamr al-Hind*, date of India, from *tamr*, date, from *tamara*, to nourish on dates, and *Hindi*, *Hindu*, *Hind*, India), *Tamarindus Indica*. A beautiful spreading tree, of the natural order Leguminosæ, a native of India, very generally cultivated in warm climates. It bears brown, many-seeded pods about six inches long and three-quarters of an inch thick, filled with acidulous, reddish-brown pulp which is exported in jam-like masses to Europe. Tamarinds are generally preserved by pouring hot syrup on the ripe pulp; but a better method is to put alternate layers of tamarinds and sugar in a stone jar, the color and taste being thus more like the fresh pulp. The wood of the tamarind tree, and especially of its roots, is extremely hard, but though worked with difficulty, it is valued for cabinet work. The tamarind plum (*Dialium indum*) and the allied brown and velvet tamarinds of Sierra Leone closely related to Tamarindus yield a similar pulp. Tamarind pulp is used in India as a cooling food, as an ingredient in curries, and for making sherbet. Tamarind trees are grown to some extent in Florida, but were not satisfactory when tested at Berkeley, Cal.

TAMARIND AND FRUIT.

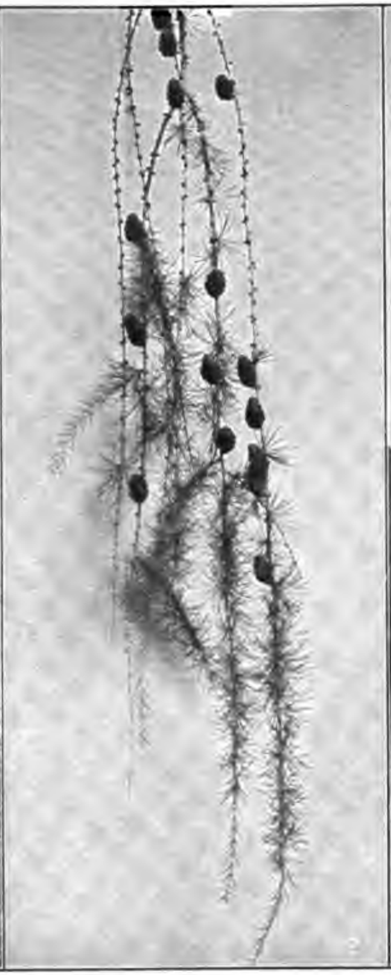
TAMARISK (Lat. *tamariscus*, *tamarix*, *tamarice*, tamarisk; perhaps connected with Skt. *tamālaka*, *tamāla*, sort of tree with dark bark, *tamas*, darkness), *Tamarix*. A genus of plants of the natural order Tamaricaceæ. The common tamarisk (*Tamarix Gallica*) grows in sandy places in the Mediterranean region and is often planted for ornament in Europe and the United States. It sometimes attains a height of 30 feet.

COMMON TAMARISK.

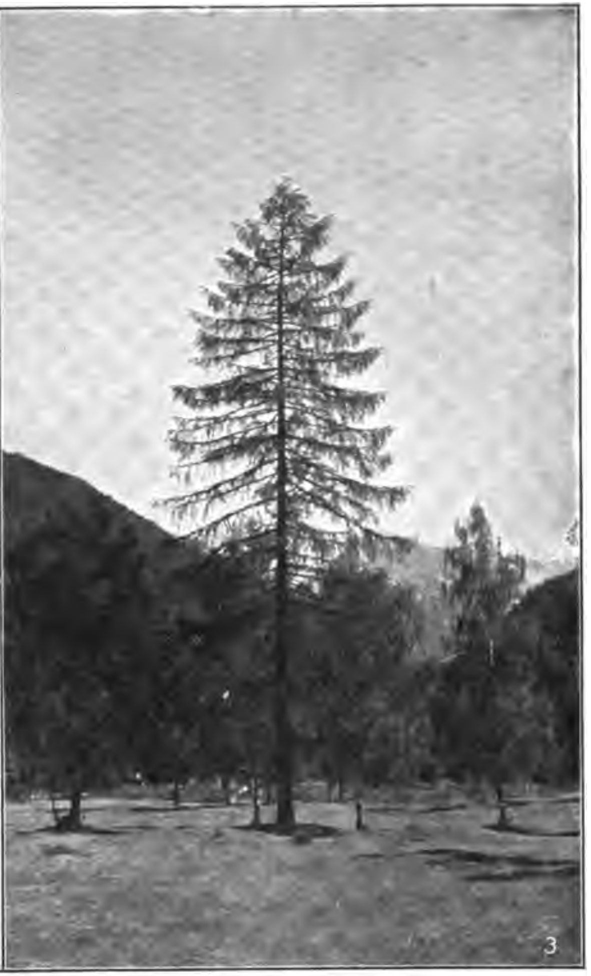
TAMARACK AND LARCH



1. TAMARACK (Larix Americana).



2. SPRAY WITH CONES OF EUROPEAN LARCH.



3. EUROPEAN LARCH (Larix Europæa).

The twigs were once in repute as a tonic. The ashes of this and some other species of the genus contain much sulphate of soda. The Oriental tamarisk (*Tamarix articulata*) is one of the few indigenous trees in the Arabian and African deserts. It is called atle or ethel. Its wood is used for fuel and for economical purposes. The galls found on some East Indian species are valued in dyeing. *Tamarix mannifera*, perhaps a variety of *Tamarix Gallica*, owing to the punctures of an insect, yields Mount Sinai manna. The German tamarisk (*Myricaria Germanica*) belongs to another genus of this order.

TAMASHEK, tăm′ȧ-shĕk. The name applied to the Berber and Tuareg languages of Mauretania and the Sahara. It occurs in various dialectic forms as Tamahâg, Tahahûg, and Tamazigt. The last form, T-ama-zig-t, survives in the Amzigh or Imazighen (q.v.), the common name of Mauretanian Berbers and thought to be identical with the Maxyes of Herodotus. Consult: Freeman, *Grammatical Sketch of the Temahug or Towarek Language* (London, 1862); Hanoteau, *Essai de grammaire de la langue tamachek* (2d ed., Algiers, 1896); Kaoui, *Dictionnaire français-tamâheq* (ib., 1894); id., *Dictionnaire pratique tamâheq-français* (ib., 1900).

TAMATAVE, tä′mȧ-tä′vȧ. The most important seaport of Madagascar. It is on the east coast in latitude 18° 10′ S., on a small peninsula (Map: Africa, J 6). It is fortified. It has a good roadstead owing to the outlying coral reefs, but the facilities are not superior for loading and unloading vessels. South of the city is a series of lagoons which have been connected by canals and thus add to the transportation advantages of the town. (See MADAGASCAR.) A railroad at present connects Tamatave with the neighboring Ivandro. The population is given at 4000. There are about 600 Europeans.

TAMAULIPAS, tä′mou-lē′pȧs. A maritime State of Mexico, bounded by Texas on the north, the Gulf of Mexico on the east, Vera Cruz and San Luis Potosí on the south, and Nuevo León on the west (Map: Mexico, K 6). Area, 32,128 square miles. The coast is flat, sandy, lined with lagoons and marshes, and but sparsely inhabited. The northern part is occupied by plains, while the southern and central portions are mountainous. Tamaulipas is watered by several large rivers, of which the largest are the Rio Grande and Pánuco, forming respectively the north and south boundaries. The climate is temperate and healthful in the interior and hot and unhealthful on the coast. Agriculture is the principal industry, but is hindered by lack of irrigation facilities. Grazing is carried on extensively. The chief exports are hides and skins, live stock, some fruits, and rubber. There are three railroad lines in the State. The Mexican Free Zone, in which imports are liable to only 10 per cent. of ordinary duties, was first established by Tamaulipas in 1858. Population, in 1900, 218,948. Capital, Ciudad Victoria (q.v.).

TAMBÓBONG, tȧm-bō′bông. A suburb of Manila, Philippines, situated about 3 miles north of the capital (Map: Luzon, E 8). Population, in 1887, 21,827; now about 25,000.

TAMBOURIN, tăɴ′bo͞o′răɴ′ (Fr. *tambourine*, diminutive of *tambour*, drum, tabor). An ancient, lively dance of Provence, in $\frac{2}{4}$ time. It was originally accompanied by a flute and a tambour (drum), hence the name.

TAMBOURINE. An ancient musical instrument of the drum type. It is composed of a piece of parchment, stretched on the top of a hoop furnished with pairs of small metal plates, and is sounded by the hands, fingers, or elbow.

TAMBOV, tăm-bôf′. A government of Central Russia, occupying an area of 25,720 square miles (Map: Russia, F 4). Its surface is mostly flat, in the basins of the Oka and the Don, and intersected by numerous river valleys. The region is watered principally by the Voronezh and the Khoper (tributaries of the Don) and by the Moksha and the Tsna (tributaries of the Oka). Iron is found near Lipetzk, but it is little exploited. Tambov is one of the most fertile governments of Russia and its southern and larger part is covered with a thick layer of black soil. Rye and oats are the principal cereals. Flax, tobacco, and sugar beets are also produced on an increasing scale. The principal manufactured products are spirits, cloth, beet sugar, flour, and tobacco. The annual value of the output is estimated at $12,000,000. Population, in 1897, 2,907,519.

TAMBOV. The capital of the Russian Government of Tambov, situated in a low region on the Tsna River, about 300 miles southeast of Moscow (Map: Russia, F 4). Population, in 1897, 48,134. The city was founded in 1636 as a fortress against the inroads of the Tatars from the south.

TAM′BURLAINE, THE GREAT. A tragedy in blank verse, by Christopher Marlowe, acted in 1587, and licensed for publication on August 14, 1590. It is in two parts, the first dealing with the many conquests of the hero, and the second with his sorrow at the death of his mistress and his own pathetic end. Its principal source is a translation of Petro Mexia's *Silva de Varia Lecion*, made by Thomas Fortesque, and published under the title of *The Foreste* in 1571. It is especially interesting as being among the first dramas to employ the bold diction and rhythmical freedom which characterized the Elizabethan stage.

TAMERLANE. See TIMUR.

TAMERLANE. (1) A tragedy by Rowe, produced at Lincoln's Inn Fields, in 1702, and adapted (1724) for the operatic stage to the music of Handel. The plot deals with the rivalry of the title character, who is more subdued than his prototype in Marlowe's play, and the villainous Bajazet. The latter represents Louis XIV., the former King William III. Owing to its political significance, the play came to be produced annually at the Drury Lane, on November 5th. (2) A poem by Edgar Allan Poe which gave its name to a volume of verse published by him in 1827.

TAMETOMO, tä′me-tō′mō. Japan's most famous archer. He belonged to the great Minamoto family and shared its misfortunes in the middle of the twelfth century. He is credited with many feats of strength and skill. He sent an arrow through the body of one man and wounded a second who stood behind him. He shot an arrow through the helmet of his own brother without hurting him. Being taken prisoner and a sinew of his arm having been extracted by his foes he came nevertheless to shoot a stronger bow and sank a boat by shooting an arrow through its bows. The accounts of his end are contradictory. After sinking the boat he fired his house and committed suicide, or he fled to Riu Kiu (Loo Choo) and became its king, the first of the historic line.

TAM'ILS. A Dravidian people of southern Hindustan and northern Ceylon, who number more than 16,000,000. They are, perhaps, the most important of the civilized Dravidian peoples of India. The Klings of the seaports of Farther India and certain parts of Malaysia are Tamils, who have emigrated temporarily or permanently from their native land. To the Tamil group belong also, in all probability, some of the wilder tribes of the hills and the region of Tinnevelli and South Travancore.

The Tamil language is the most important of the Dravidian languages. (See DRAVIDIANS.) It is spoken in the northern half of Ceylon, and the territory between Cape Comorin and Pulicat, north of Madras, extending inland about halfway across India. Tamil is divided into Old or Son Tamil, and Modern or Kodun Tamil. The differences between the two epochs of the language are very marked. Of all the Dravidian tongues Tamil is the most archaic. It has nine cases, two numbers, and in gender distinguishes between 'high caste' (men, gods, spirits, etc.) and 'low caste' (animals, inanimate things, and abstract ideas). The verb is formed by suffixing the personal pronouns to a predicative verb stem. The same base, therefore, when case-suffixes are added, serves as a noun, and when the pronouns are affixed as a verb. The original tenses are the present, the preterite, and the future, but periphrastic formations denote the continuative or durative, the perfect and pluperfect, and the future perfect. Moods are altogether lacking. In its vocabulary Tamil is exceedingly rich, especially in compounds and synonyms. The alphabet, which is closely akin to that of the Telugu (q.v.), is based on one of the old forms of the Sanskrit Devanagari script. (See DĒVĀNAGARĪ.) Tamil literature is abundant and important. An outline is given under the title DRAVIDIANS.

Consult: Mateer, *Native Life in Travancore* (London, 1883); Caldwell, *Tinnevally and the Tinnevally Mission* (Madras, 1869); id., *Comparative Grammar of the Dravidian, or South Indian Family of Languages* (2d ed., London, 1875); Rhenius, *Grammar of the Tamil Language* (4th ed., Madras, 1888); Pope, *First Lessons in Tamil* (5th ed., Oxford, 1891); Hultzsch, *South Indian Inscriptions, Tamil and Sanskrit* (Madras, 1890-95): Burnell, *Elements of South Indian Palæography* (2d ed., London, 1878); Graul, *Bibliotheca Tamulica* (Leipzig, 1854-65).

TAMING OF THE SHREW, THE. A comedy by Shakespeare, written before 1596, produced in 1603. It is adapted from an earlier play entitled *The Taming of a Shrew*, of questionable authorship, produced in 1594. The story of Bianca is taken from Ariosto's *I Suppositi* through Gascoigne, *Supposes*, a play of 1566. The taming of Katherine by her husband is a form of an old and widespread story found in the *Arabian Nights* and in Straparola.

TAMISE, tȧ'mēz'. A town in the Province of East Flanders, Belgium, 11 miles southwest of Antwerp, on the Scheldt, and on the railway from Mechlin to Saint Nicholas (Map: Belgium, C 3). Its chief manufactures are cotton and woolen fabrics, laces, soap, and wooden shoes; boat-building and jute and flax spinning are carried on. Population, in 1900, 12,463.

TAMMANY HALL. The name applied (1) to a powerful political organization in New York City; (2) to the building which serves as the organization's headquarters; and (3) sometimes incorrectly to the society from which the organization leases the building. The name is adapted from that of an Indian chief, Tamanend, of the Lenni Lenape or Delaware tribe, who was famous for his virtues and his wisdom, but about whom little is definitely known. His name appears on deeds for tracts of land, dated June 23, 1683, and July 5, 1697; and according to tradition he died about 1740, and was buried in New Britain Township, Bucks County, Pa. Before and during the Revolutionary War, societies with Tamanend as their patron saint were organized in imitation, and to a certain extent in ridicule, of such societies as Saint Andrew's Society, Saint David's Society, Saint George's Society, and the Friendly Sons of Saint Patrick. The organizations were of a patriotic nature, and were affiliated in spirit with the Sons of Liberty. In Philadelphia the Sons of King (later Saint) Tammany met almost every year from 1772 to 1791, and later, in 1795, a short-lived branch of the New York society was established there.

On May 12, 1789, William Mooney, an upholsterer, who previously had been active as one of the Sons of Liberty, founded in New York, ostensibly as a patriotic and social organization, the secret Society of Saint Tammany or Columbian Order, which in 1805 was regularly incorporated as a fraternal aid association. The ritual and organization of an Iroquois lodge were followed more or less closely by the founders, the society being divided into thirteen tribes, each of which had its separate totem, the year being divided into four seasons, each month being called by some distinguishing characteristic, and the officers being known as the grand sachem, sachems, the sagamore, or master of ceremonies, and the wiskinskie, or doorkeeper. In 1811 the society built its first hall, at the corner of Frankfort Street and Park Row, and in 1867 moved into the present Tammany Hall on Fourteenth Street. The political organization is nominally distinct from the society, but the two may in many respects be regarded as virtually identical, the leadership of both being largely in the same hands.

Though the society was ostensibly organized for patriotic, social, and benevolent purposes, it early took an active interest in politics and soon came to stand distinctively for Democracy and decentralization, identifying itself definitely (in 1798) with the Democratic-Republicans as opposed to the Federalists. Aaron Burr is supposed to have given the society (indirectly) its first training in the devious ways of practical politics, and in 1800 the society first took an active part in a political campaign, being instrumental in carrying New York for Jefferson. From that time to the present Tammany has generally assumed to be the local representative of the National Democratic Party, and has exerted a powerful influence on the political history of the State, and a preponderating influence on the political history of the city. At times the organization has been bitterly assailed by rival factions of the Democratic Party, and on at least one occasion, in 1878, it bolted the party's regular State ticket, but for the most part it has controlled a vast majority of the Democratic voters of the city. After 1834, when the mayoralty first became elective, it devoted its attention primarily to securing control of the city government, and from 1834 to 1903 succeeded in electing fully two-thirds of the mayors. Gradually its organization became more and more perfected, and the inrush of immigrants after about 1840 added enormously to its strength, Tammany succeeding largely by its political skill and tact in securing the adhesion of an immense majority of the foreign-born citizens. In order to secure proper compactness and discipline within the organization, great power was necessarily thrown into the hands of a few individuals, and in the history of Tammany many of its officers are alleged to have succumbed to the temptations which such power has brought. From an early period charges of corruption, peculation, and blackmail were made against Tammany leaders by their political opponents, and the climax was reached in 1869-71, when Tweed and his associates were proved to have robbed the city of untold millions. (See TWEED, WILLIAM M.). Damaging disclosures concerning the methods of Tammany were also made during the investigations conducted respectively by the State Committee on Cities, headed by J. Sloat Fassett, in 1890, the special committee of the State Senate, headed by Clarence Lexow, in 1894, and the special committee of the State Assembly, headed by Robert Mazet, in 1899.

Tweed was the first to exercise over Tammany the powers of the modern 'boss.' After the exposure of his colossal frauds, Tammany was reorganized by John Kelly (q.v.), who caused some of the most prominent of Tweed's prosecutors—men like Tilden, Charles O'Conor, Horatio Seymour, and August Belmont—to be chosen as officers, while he, by perfecting the 'machinery' of the organization, gained almost entire control. At his death in 1886 he was succeeded by Richard Croker (q.v.), who, however, did not exercise the powers of a 'boss' until 1888, and who in 1901 retired. Lewis Nixon (q.v.) was then nominally the leader for several months. Tweed, Kelly, Croker, and Nixon had each been chairman of the finance committee; this committee was reorganized in 1903, after the policy of Tammany had been shaped for a time by a 'triumvirate,' and Charles F. Murphy was chosen leader, though nominally with greatly curtailed powers.

In organization, Tammany is highly centralized, the power resting ultimately in the hands of one man or of a relatively small number of men. There is a captain for each election district in the city, and a district leader for each Assembly district. The executive committee of the organization is generally made up of these various district leaders; while in addition each district elects a certain number of men to the so-called General Committee, in which ostensibly the power rests, and in whose name the lease of the building known as Tammany Hall is held. The men elected by each district to the General Committee, whose membership is somewhat in excess of five thousand, form the General Committee for that district, and are presided over by the district leader. The General Committee has standing sub-committees on finance, printing, naturalization, correspondence, and organization.

The power of Tammany is traceable, however, to something more than mere machine organization. It makes a systematic appeal for the votes of the lower classes, and accomplishes its purpose by numerous acts of real charity; by gratifying the social instincts of the tenement dweller, the district leaders giving at their own expense frequent dances, chowder parties, picnics, and excursions; by bailing unfortunates out of jail; by systematically ingratiating itself with the vast numbers of immigrants; by securing work for the unemployed; by an extensive and generally astute use of patronage (when Tammany is in power); and apparently by the application of 'pressure' and by various acts of virtual intimidation. It also gains tens of thousands of votes by virtue of its position as the representative in New York of the Democratic Party; and, by the lax enforcement of sumptuary laws when in power, it wins the support of those voters who on principle or through motives of self-interest oppose such laws. Arrayed against it are a large majority of the cultured and well-to-do classes, the members of the Republican Party, and large numbers, representing various classes, who are convinced that Tammany government means a government of blackmail, of fostered vice, of police corruption, and, if not of outright dishonesty in all respects, at least of general wastefulness and inefficiency.

Consult: Myers, *History of Tammany Hall* (New York, 1901); Blake, *History of the Tammany Society or Columbian Order* (ib., 1901), written from the Tammany standpoint; a chapter by Talcott Williams in *Historic New York*, vol. i. (ib., 1899); several chapters in defense of Tammany in Thompson, *Politics in a Democracy* (ib., 1894); a chapter in Bryce, *The American Commonwealth* (ib., 1895); an article by Davis, "The Most Perfect Political Organization in the World," in *Munsey's Magazine*, vol. xxiv. (ib., 1901); Jernegan, *Tammany Societies in Rhode Island* (Providence, 1895); and Cabeen, "The Society of the Sons of St. Tammany of Philadelphia," in the *Pennsylvania Magazine of History and Biography*, vols. xxv., xxvi., and xxvii. (Philadelphia, 1901, 1902, and 1903).

TAMMERFORS, tăm'mẽr-fôrs. The principal manufacturing city of Finland, Russia, situated in the Government of Tavastehus, close to the falls of Tampereenkoski and 125 miles northwest of Helsingfors by rail (Map: Russia, B 2). It is a modern town with extensive cotton, paper, and iron mills and various other manufacturing establishments, whose motor power is supplied chiefly by the near-by rapids. Population, in 1898, 28,725.

TAM'MUZ. A deity of Babylonian origin whose cult is referred to by the prophet Ezekiel (viii. 14), who describes his horror at seeing women sitting in the north gates of the temple and weeping for Tammuz. The worship of Tammuz (under the form Dumu-zi) may now be traced back to the oldest period of the Babylonian religion. He appears to have been originally an agricultural deity, whose seat of worship may have been at Eridu on the Persian Gulf. In the developed Babylonian mythology, however, he became the symbol of the decay of vegetation after the close of the summer season, pictured as slain by the goddess Ishtar after she has secured him as her husband. The death of Tammuz gave rise in Babylonia to the mourning ceremonies described by Ezekiel, and from Babylonia as a centre the cult spread to the West. Among the Canaanites and Phœnicians, Tammuz was known as *Adonai*, 'the lord,' and this name survives under the form Adonis (q.v.). Among the Phœnicians the chief temple and worship of Adonis was at Byblus (or Gebal), and from Phœnicia the Adonis cult was carried to Cyprus and Greece, where he was connected with Aphrodite. His festivals were partly the expressions of joy, partly of mourning. In the latter the women gave themselves up to the most unmitigated grief over the 'lost Adonis,' shaved off their hair, and sacrificed their chastity in his temples. The days of mourning were completed by a solemn burial of an image of the god. This period was followed by a succession of festive and joyful days, in honor of the resurrection of Adonis. The river Adonis (Nahr Ibrahim), which once a year 'ran purple to the sea' from the Lebanon, was supposed to be tinged by the blood of the god; and a vessel sent off from Alexandria, and carried by the tide to Byblus, used to inform the mourners by letter that he had been found again. These feasts were celebrated during the summer solstice. The fourth month in the Babylonian calendar, known as Tammuz and adopted by the Hebrews, preserves the name of the god and furnishes a valuable testimony as to the time when his festival was celebrated, since the Babylonian year began in the spring. Adonis of Byblus was identified at a later period with Osiris, and the myth underwent various transformations in thus passing from one people to the other. Consult: Robertson Smith, *Religion of the Semites* (London, 1894); Frazer, *The Golden Bough* (London, 1900).

TAM O' SHANTER. One of the best known poems of Robert Burns, based on the popular belief that no evil spirit can pass the middle of a running stream. The hero is pursued by 'Cutty Sark' for disturbing a dance of imps at Alloway Kirk, and succeeds in crossing the River Doon in safety.

TAMPA. A port of entry and the county seat of Hillsboro County, Fla., 240 miles south by west of Jacksonville, at the mouth of the Hillsboro River, on Tampa Bay, and on the Atlantic Coast Line and the Seaboard Air Line railroads (Map: Florida, F 4). There is also steamship connection by way of Port Tampa with the principal Atlantic and Gulf ports. Tampa is favored with an attractive situation and a healthful climate, and has become a famous winter resort. Noteworthy are the Tampa Bay Hotel, one of the largest tourist hotels in America; De Soto Park, the scene of the encampment of the United States Volunteers during the Spanish-American War: the old Government reservation; and the Convent of Holy Names. Tampa is an important shipping point through Port Tampa for phosphate, fruits, vegetables, turpentine, rosin, lumber, fish, cattle, and wheat flour. Tobacco is imported extensively. In the year ending June 30, 1901, the total trade of the customs district amounted to $2,834,871, including exports to the value of $1,321,419. The industrial interests of the city are confined chiefly to the manufacture of cigars, the output of which in 1902 was valued at nearly $10,000,000. Fishing also is largely carried on. Under the charter of 1899, the government is vested in a mayor, chosen biennially, and a unicameral council. Tampa was settled in 1848 as an army post, and was incorporated in 1886. In the latter year it became a port of entry. During the decade 1890-1900 the city had a very rapid growth, the population, in 1890, being 5532; and in 1900, 15,839.

TAMPA BAY. An inlet of the Gulf of Mexico on the west coast of Florida (Map: Florida, F 4). It is about 40 miles long, and from 6 to 15 miles in width, the northern part being divided into Old Tampa and Hillsboro bays. Its entrance is protected by a line of keys, or low islands, and it forms an excellent harbor with a depth of 22 feet in the main entrance. It contains a number of small islands.

TAMPAN. A tick (q.v.), of Southern Africa, remarkable for its very poisonous bite, found in Angola, and southward, and described by Livingstone in his *Travels*. It attacks by preference the parts between the fingers or toes, attains the size of a pea, and when filled with blood is dark-blue, and so tough that it cannot be burst by squeezing with the fingers. The first effect of the bite is a mingled sensation of pain and itching, which ascends the limb until it reaches the abdomen, and soon causes either violent vomiting and purging, or fever. The tingling sensation lasts for a week.

TAMPICO, tȧm-pē'kō. A Mexican seaport in the State of Tamaulipas, 206 miles northeast of the City of Mexico, on the Pánuco, near its mouth (Map: Mexico, K 6). The town lies only 25 to 50 feet above sea level, and is surrounded by lagoons, which make it very unhealthful. It has broad streets and squares, the largest of the latter, the Plaza Constitución, having a public garden in its centre. The most notable building is the parish church of the Jesuits. The harbor has been improved by the construction of a breakwater and jetty, so that the trade in wool, hemp, hides, honey, drugs, Cuba wood, and mining ores, in exchange for manufactured articles, now surpasses that of Vera Cruz. The Monterey and Mexican Gulf and the Mexican Central branch of the San Luis Potosí railroads connect the town with the interior States of Northern Mexico, of which it is the chief outlet. Its population in 1895 was 11,912. Tampico was an Aztec city. In 1683 it was destroyed by the pirate Lorencillo and was not rebuilt till 1823. It received the name Santa Ana de Tamaulipas in 1834, and was the scene of a Mexican victory over the Spanish in 1827.

TAMSUI, tăm'sōō'ē (Chin., Freshwater). A port on the north coast of Formosa, opened to foreign residence and trade by the treaty of Tientsin (1858), and continued as such by the Japanese. It stands at the mouth of the Tamsui River, 13 miles from Jai-peh. The principal exports are tea, rice, sugar, camphor, coal, flax, hemp, jute, etc., chiefly to China, Hong Kong, British India, and the United States, and the imports are salt, flour, kerosene oil, cotton and woolen goods, lead, and other metals, tobacco, joss-sticks, etc. The population is estimated at over 6000.

TAM-TAM (Hind., drum, onomatopoetic in origin). An Indian or Chinese musical instrument. It consists of a metal disk concave in the middle and is suspended by a loop. The tone is produced by striking the disk with a stick having a soft knob made of felt or leather.

TAM′WORTH. A municipal borough and market town, on the borders of Staffordshire and Warwickshire, England, at the confluence of the Tame and Anker, 13 miles northeast of Birmingham (Map: England E 4). Its chief buildings are the castle built on the site of a Saxon fort and the Church of Saint Editha, founded in the eighth century. It acquired in 1897 the historic castle which had descended through the female line of the Marmions to the Marquis of Townshend. Market gardening, brickmaking, brewing, dyeing, wool-stapling, and manufactures of tapes and small wares are carried on. From the beginning of the eighth century Tamworth was the chief Mercian royal residence. Burned by the Danes in 911, it was rebuilt by Ethelfleda, daughter of Alfred the Great. Population, in 1901, 7271. Consult Palmer, *History of Tamworth* (London, 1871-75).

TANA, tä′nȧ. A river in British East Africa (Map: Africa, H 5). It rises in numerous headstreams in the southwestern slope of Mount Kenia, and flows southeast after making a long detour to the north, emptying into the Indian Ocean in latitude 2° 47′ S. Its length is over 500 miles. Its upper course down to Hameye is that of a mountain stream, full of falls and cataracts. Below that point it runs 360 miles through alluvial plains and is navigable for light-draught vessels in the rainy season. Its importance as a waterway into the interior of Africa is considerably diminished by the bar which obstructs its entrance.

TANAGER (from Neo-Lat. *Tanagra*, from Brazilian *tangara*, the native name of the bird). The popular name for the Tanagridæ, a family of birds having a conical beak, triangular at the base, the upper mandible notched toward the tip, and its ridge arched. The family is closely related to the finches and about 350 species are known, all American and nearly all tropical. Only five species occur as far north as the United States and only two of these reach Canada. They are all birds of moderate or small size, six to eight inches long or less, but of surpassingly gaudy plumage, though the brilliancy is frequently confined to the male sex. They are arboreal birds, feeding on fruit and insects, and have little power of song, but a few species are musicians of some merit. The best known of the three North American forms is the scarlet tanager (*Piranga erythromelas*), the most brilliant bird of the Northern United States. The male is bright scarlet with black wings and tail; the female light olive-green above and greenish yellow beneath. The immature males are like the females, but have the black wings and tail, and the adult male assumes this plumage in winter. The scarlet tanager breeds as far north as New Brunswick and as far west as Kansas, but winters in Central and South America. It builds its nest near the end of a horizontal limb; the nest is a rather loose, shallow structure of twigs, weeds, and rootlets. The eggs are pale bluish with numerous reddish-brown spots. The scarlet tanager is not a notable musician, but its song is pleasing. From New Jersey southward there is found from April to September the summer tanager (*Piranga rubra*), which is rose-red, brighter below, the wings fuscous margined with rose. The female is orange olive-green above, buffy yellowish green below. In habits, nesting, and song it resembles the scarlet tanager. From the eastern foothills of the Rockies to the Pacific there is found in summer a beautiful bird, the Louisiana or crimson-headed tanager (*Piranga Ludoviciana*). The male is bright yellow, with the whole head crimson or scarlet, and the back, wings, and tail black. The female is exactly like the female scarlet tanager, except for the white or yellowish markings on the wings. In nesting and other habits this exquisite bird resembles the others. Consult Ridgway, *Birds of North and Middle America*, part ii. (Washington, 1902). See Colored Plate with THRUSH.

TAN′AGRA (Lat., from Gk. *Τάναγρα*, modern Grimadha). An ancient city in eastern Bœotia close to the Athenian border. It did not play any part in ancient history, but near it was fought an important battle between the Athenians and Spartans in B.C. 457. Through the treacherous desertion of the Thessalian cavalry the Athenians were defeated, but later in the same year at Œnophyta in the same district they won a great victory which made them masters of Bœotia. During the Hellenistic and Roman periods Tanagra was a flourishing agricultural community, said to produce the best wine in Bœotia. It is now deserted, though the line of ancient walls is marked by mounds of rubbish, and there are remains of the theatre and other ancient buildings. The chief fame of the town is due to its extensive necropolis, first opened in 1874, and since then the scene of countless open and clandestine excavations. The tombs or graves have yielded the long series of graceful and charming terra-cotta statuettes, known as Tanagra figurines. In many cases these were broken before being cast into the grave, and their significance has caused much discussion, in which an occult symbolism has not been proved. The high value attached to these little figures has led to much modern forgery and it is often hard even for an expert to detect the imitations.

TA′NAIS. The ancient name of the Don.

TANANA, tȧ-nä′nȧ (South American name). One of the singing grasshoppers of the genus Locusta, common in Brazil, whose music is much admired by the natives, who keep it in little cages much as the Japanese keep crickets.

TANANARIVO, tȧ-nä′nȧ-rē′vō. The capital of Madagascar. See ANTANANARIVO.

TAN′AQUIL. The wife of Tarquinius Priscus.

TANAUAN, tȧ-nä′wȧn. A town of Leyte, Philippines, situated 10 miles from Taclobán (Map: Philippines, J 8). Population, 18,500.

TANAUAN. A town of Luzon, Philippines, in the Province of Batangas (Map: Luzon, F 10). It is situated on the principal highway from Batangas to Manila, about 27 miles north of Batangas. The town was founded in 1584, on the shore of Lake Taal, but was destroyed in 1754 by an eruption of the volcano Taal (q.v.), and later rebuilt in its present position not far from the lake. Population, over 21,000.

TAN'CRED (c.1050-1112). Prince of Antioch, a hero of the First Crusade. The first authentic information respecting him is that he joined his cousin Bohemund in the First Crusade in 1096. They landed in Epirus, and took the oath of allegiance to the Greek Emperor, Alexius (q.v.). Tancred's exploits on the way to Syria; his quarrel with Baldwin for the possession of Tarsus; his valor before Antioch, where he took an oath that as long as he had forty knights he would never withdraw from the expedition to Jerusalem; and the praises of his biographer, Radulph of Caen, have given him a fictitious importance. After the conquest of Jerusalem he became Prince of Galilee. A quarrel with Baldwin, after Godfrey's death, caused him to give up his possessions in the Kingdom of Jerusalem. While Bohemund was in captivity he ruled over Antioch. When Bohemund died in 1111, Tancred became Prince of Antioch, where he died in 1112. Tancred has been made famous by Tasso in his *Gerusalemme Liberata*. For the actual facts during the most important period of his life, consult Kugler, *Boemund und Tankred* (Tübingen, 1862).

TANCRED AND GISMUNDA. A tragedy played before Queen Elizabeth in 1586, published by Robert Wilmot in 1591. Its title page explains that it was "compiled by the Gentlemen of the Inner Temple, and by them presented before her Majestie." The authors were probably five in number. It was founded on a story by Boccaccio, the substance of which makes the plot of Tale 39 in Painter's *Palace of Pleasure* (London, 1566-67). It was originally written in rhymed quatrains, which Wilmot, however, changed to blank verse on publication.

TANCRED OF HAUTEVILLE, ōt'vēl'. A Norman noble, father of several sons who established by force of arms the Norman power in Southern Italy and Sicily. The most celebrated of the brothers were Robert Guiscard and Roger I. (qq.v.).

TANDOLANO, tän'dō-lä'nō. A wild Malay tribe in Palawan Island. See Philippine Islands.

TAN'DY, James Napper (1740-1803). An Irish agitator, born in Dublin. During the American Revolution he took an active part in the effort to prevent the use of English goods in Ireland; was an enthusiast in the 'volunteer movement;' on May 27, 1782, commanded the corps of artillery that guarded the approaches to the Irish Parliament when that body met to receive the answer of the Ministry to the demand for legislative independence; and was one of the foremost in the volunteer convention of November, 1783. Ten years afterwards when he was about to be tried for writing a seditious pamphlet called "Common Sense," he fled to the United States. In 1798 he went to Paris and was put in command of a vessel for an invasion of Ireland. He remained on Irish soil, however, but eight hours, and then went to Bergen, and from there by land to Hamburg. At the latter place he was seized and was delivered to the English, and upon his arrival in Ireland was condemned to death. Bonaparte, however, brought such pressure to bear in his favor that the prisoner was released. He soon after went to France and was made a general of division. He was the hero of the famous ballad, "The Wearing of the Green." Consult: Lecky, *History of England in the Eighteenth Century* (London, 1878-90).

TANERA, tȧ-nā'rȧ, Karl (1849-1904). A German military writer and novelist, born at Landshut, Bavaria. He entered the Bavarian army in 1866, took part in the campaign of 1870-71, and was severely wounded during the siege of Paris. Having frequented the Kriegsakademie in Berlin, in 1877-80, he was detailed to the department of military history in the great general staff, in 1882, but retired as captain in 1887 to devote himself exclusively to his literary work. To the collective work *Der Krieg von 1870-71, dargestellt von Mitkämpfern* (1888-91) he contributed vols. i., iii., v., and vii.; and next published *Deutschlands Kriege von Fehrbellin bis Königgrätz* (1891-94). His novels, military sketches, essays and reminiscences of his extensive travels in the East and North Africa include: *Durch ein Jahrhundert, Drei Kriegsgeschichtliche Romane* (1892); *Schwere Kämpfe* (1897); *Aus zwei Lagern, Kriegsroman* (1899); *Die Eurasierin* (1900); *Ernste und heitere Erinnerungen eines Ordonnanzoffiziers* (1887, 8th ed., 1902); *Offiziersleben in Krieg und Frieden* (1889); *Heiteres und Ernstes aus Altbayern* (1895); *Aus drei Weltteilen, Reiseskizzen* (1898); *Deutschlands Kämpfe in Ostasien* (1901); and *Eine Weltreise* (1902).

TANEY, tą'nĭ, Roger Brooke (1777-1864). An eminent American jurist, Chief Justice of the United States Supreme Court. He was born in Calvert County, Md.; graduated at Dickinson College, Pa.; studied law at Annapolis; and in 1799 was admitted to the bar. In 1823 he removed to Baltimore, where he succeeded William Pinkney and Luther Martin as head of the Maryland bar. In 1827 he was elected Attorney-General of the State, and, having become a Democrat and a supporter of Andrew Jackson, was appointed Attorney-General of the United States in 1831. In this capacity he became one of Jackson's most trusted counselors, encouraged him to remove the United States Bank deposits, and upon the refusal of William J. Duane, then Secretary of the Treasury, to obey Jackson's orders to this effect, was appointed in Duane's stead, though his appointment was never confirmed by the Senate. Taney promptly removed the deposits and thus further won the confidence of his chief. In 1836 he succeeded John Marshall as Chief Justice of the United States Supreme Court. In this capacity he sustained in the main the high reputation of his distinguished predecessor for legal learning and acumen, though as a result of the passions engendered by the approaching civil strife some of his opinions were severely criticised. He wrote the opinion of the court in many important cases, the most notable being that of Dred Scott. (See Dred Scott Case.) During the Civil War Chief Justice Taney gave opinion in the noted case of *Ex-parte Merryman* in answer to an application for a writ of *habeas corpus* in behalf of a citizen of Baltimore who had been arrested by a United States officer on a charge of treason, denying in strong and vigorous language the right of the President to suspend the writ of *habeas corpus* and affirming that that power was vested in Congress alone. A memoir of Taney's life, in part an autobiography, was published in 1872 by Samuel Tyler.

T'ANG, täng. One of the seven most celebrated dynasties of China. It lasted from 618 to 907 and was founded by Li Yuan, a soldier and a descendant of one of the princely houses, who, after a reign of eight years, during which many reforms were introduced, abdicated in favor of his second son, Li Shih-min, the real unifier of the Empire and the most illustrious of the T'ang rulers (627-649). With the twelfth Emperor decay began to set in and in 907 the line came to an end. In 923 a descendant of one of the T'ang emperors established the Posterior T'ang, which came to an end in 936 under its fourth Emperor.

The T'ang is undoubtedly one of the most brilliant periods of Chinese history. The Empire was extended to the Caspian Sea and China itself was divided into fifteen provinces. In 628 a maternal uncle of Mohammed visited China and built the mosque at Canton, and a century and a half later 4000 Mohammedan soldiers, whose descendants now form an important element of the population, settled in the country. Learning and literature were fostered, the Hanlin Yuan (q.v.) had its beginning, and Buddhism, Taoism, and even Nestorian Christianity flourished under Imperial patronage. Paper money was then first used and the Peking *Gazette* was founded.

TANGANYIKA, tän'gȧn-yē'kȧ. A large lake in Central Africa, extending from latitude 3° 16′ to 8° 48′ S., and from longitude 29° 20′ to 31° 20′ E. (Map: Africa, H 5). Its northern end is 175 miles southwest of the Victoria Nyanza, and its southern end 190 miles northwest of Lake Nyassa. It lies in the western branch of the Great Rift Valley (q.v.), which is interrupted at the south end of the lake by a plateau, but continued farther to the southeast as the basin of Lake Nyassa. Tanganyika extends in a north and south direction, with a length of 400 miles and a breadth of 20 to 40 miles. Its area is estimated at over 12,000 square miles. Its basin, which includes a narrow strip of fertile lowland along either shore, is bounded by the high and steep sides of the Rift Valley, which in some places form precipitous rocky cliffs, and reach a height of 4200 feet above the level of the lake, which is 2700 feet above the sea. The depth is very great, ranging in the greater portion from 500 to over 2000 feet, and the lake is remarkably free from shoals, reefs, or islands. There are, however, floating islands of vegetation, the shores being often very densely forested with palms. Navigation is also rendered dangerous by severe hurricanes and tornadoes to which the basin is subject. The lake is fed by numerous small streams from the surrounding plateau, and discharges into the Congo through the Lukuga, which leaves it near the middle of the western shore. This discharge, however, is intermittent, and the level of the lake is subject to periodic fluctuations, each of which may range over a series of years. The fall of the lake level in recent times has amounted to two feet annually. Though the water is, as a whole, fresh, it has in some portions a tendency to become brackish. The fauna of the lake is very rich and peculiarly interesting. Besides the usual fresh-water fish, crocodiles, and hippopotamuses, all of which are abundant, there are a number of peculiar isolated groups of deep-water mollusks and crabs which are asserted to be of marine origin. This fact points to the theory that in Jurassic or Cretaceous times the lake was an arm of the sea which became isolated by subsequent upheavals.

Politically the west shore belongs to the Congo Free State, the east shore to German East Africa, and the south shore to the British colony of Rhodesia. All three powers have trading and mission stations on the shores, and several steamers have been launched on the lake. Of the numerous native towns the largest is Ujiji, on the east shore. Lake Tanganyika was discovered in 1858 by Burton and Speke, and later explored by Livingstone, Cameron, Stanley, and others. Consult Peters, *Das deutsch-ostrafrikanische Schutzgebiet* (Munich, 1895).

TANGENT (Lat. *tangens*, pres. part. of *tangere*, to touch; connected with Goth. *tēkan*, Icel. *taka*, AS. *tacan*, Eng. *take*). An unlimited straight line which meets a curve in but one point, without cutting it. The point is called the point of contact or point of tangency. A tangent may be thought of as the limiting position of a secant, the point of tangency being the point in which the points of intersection of the secant with the curve coincide. In the circle there is but one distinct tangent at any point in the circumference, and this is perpendicular to the radius at that point. The segments of two tangents to a circle from an external point, limited by the point and the points of contact, are equal. If the point moves up to the circumference, the segments become zero and the tangents coincide; if the point moves inside the circumference, the tangents become imaginary. (See CONTINUITY.) All conic sections being of the second class (see CURVE) admit of but two tangents from any point. Curves belonging to higher classes admit of a greater number, depending upon the class. Tangents are of different orders of contact (see CONTACT) according to the number of coincident points at the point of tangency, and thus serve to distinguish various singularities of curves. (See CURVE.) In coördinate geometry the projection, upon the X-axis, of the segment of the tangent between the point of contact and the X-axis is called the subtangent. An important class of tangents are known as asymptotes (q.v.). In the geometry of surfaces the tangent plane corresponds to the tangent line of curves. The extensive list of properties involving tangents is best obtained from works on analytic geometry.

TANGERMANN, tăng'ĕr-măn, WILHELM (1815—). A German Old-Catholic theologian, known as an author by the pseudonym Victor Granella. He was born at Essen-on-the-Ruhr and studied theology at Münster and Munich. In 1846 he became priest at Neuss and afterwards held several prominent positions in his Church. In 1870 he was deprived of his offices because of his having refused to acknowledge the Vatican's decrees, and afterwards he was prominently identified with the Old-Catholic movement. From 1872 to 1888 he was in charge of the congregation at Cologne. His numerous writings include: *Wahrheit, Schönheit und Liebe, Philosophisch-ästhetische Studien* (1857); *Philosophie und Christentum in ihren Beziehungen zur Kultur und Religionsfrage* (1875); and *Natur und Geist* (1894).

TANGERMÜNDE, täng′ẽr-mṳn′de. A town in the District of Magdeburg, Prussia, 63 miles west of Berlin, on the Elbe. The town still retains its old walls, gates, and towers, its twelfth-century Church of Saint Stephen, an ancient castle, now the district building, and the old council house. There are a large sugar refinery, mills for manufacturing rape-seed oil and bone meal, and boat-building establishments. Population, in 1900, 11,524.

TANGHIN (Malagasy name), *Cerbera Tanghin*. A tree of the natural order Apocynaceæ. The kernel of its fruit was formerly used in Madagascar, where the tree is native, to determine the guilt or innocence of persons charged with witchcraft and like odious crimes. If guilty of anything the fear of the accused was often so intense that fatal results followed the taking of even minute quantities of the powdered kernels and sometimes also when innocuous substances were substituted; but if innocent the accused would generally be fearless and eat freely, in which case an emetic action followed by no serious after effects would result.

TANGIER, tăn-jẽr′, or **TANGIERS.** The chief seaport of Morocco, and the capital of the Province of Haâbat, on the Bay of Tangier, in the Strait of Gibraltar, 8 miles east of Cape Spartel and 35 miles southwest of Gibraltar (Map: Africa, D 1). It is a healthful town in spite of wretched sanitary conditions. It is fortified and surrounded by ancient ruins of walls and by gardened areas. It is picturesquely Oriental and its life is highly interesting. The white Moorish houses, amid towers and gates, rise above one another from the sea in the form of an amphitheatre, the highest point being crowned by a castle. The houses are of one story; the streets, steep, and too narrow for wagons or carriages. The main street leads from the harbor on the east to the new market and to the Socco de Barra on the southwest. It passes the Great Mosque, whose handsome gate and tower are noteworthy. Near by is the Small Socco, with its interesting bazaars—the business centre of the town. The Kasba, or castle, dating from the fifteenth century, stands on the plateau in the northern part of the city. The plateau extends from the lofty Marshan toward the sea, and furnishes a superb view. The castle or citadel is a dilapidated mass of buildings. The adjacent palace of the Sultan and the residence of the Governor are imposing edifices. The North American Mission and the Gospel Union of Kansas have their headquarters in Tangier, and there are a Catholic chapel, several synagogues, and a hospital. Tangier is lighted by electricity. The harbor is the best in Morocco, although it is both small and shallow. The annual exports are about $1,300,000. The imports are about $1,500,000, largely represented by cotton. The shipping entered in 1900 was 424,000 tons. The famous Morocco leather is made here. Population, about 30,000, including 6000 Christians and 7000 Jews.

Tangier is the Roman Tingis, and was the capital of a Roman province. It was held in turn by the Vandals, Byzantines, Arabs, and Portuguese, who obtained possession of it 1471. It came to the English in 1662 as part of the dowry of Catharine of Braganza, wife of Charles II., but was abandoned by them to the Moors in 1684.

TANGLEWOOD TALES, The. A volume of stories for children by Hawthorne (1853). The stories are old Greek myths told in an attractive style, and supposed to be brought to the author by Eustace Bright, the assumed narrator of the stories contained in the *Wonder Book*.

TA′NIS. The Tyrian name of the goddess Astarte (q.v.).

TANIS (Lat., from Gk. **Τάνις**, Egyptian *Za‘net*, Hebrew *Zo‘an*). A city of ancient Egypt in the northeastern corner of the Delta. It was situated on the right bank of the Tanitic branch of the Nile, near the site of the modern fishing village of San. Tanis was the capital of the fourteenth nome of Lower Egypt, and was a place of importance in very early times. The kings of the Sixth Dynasty founded there a great temple which was subsequently restored and enlarged by their successors of the Twelfth and Thirteenth Dynasties, and the city was for some time the capital of the Hyksos rulers. Under the Nineteenth Dynasty it was strongly fortified as a base of military operations against Palestine and Syria, and Rameses II., who established his residence there, restored the ancient temples and greatly embellished the city. The Twenty-first Dynasty, of Tanitic origin, made the city the capital of Egypt, and at the time of the Assyrian invasions in the seventh century B.C. it was the seat of a prince. Until the founding of Alexandria it was one of the chief commercial cities of Egypt, but the silting up of the Tanitic mouth of the Nile diverted its trade to the new capital of the Ptolemies, and it gradually fell into ruins. Excavations of the site, conducted by Mariette in 1860, and by Petrie in 1883-84, brought to light the remains of extensive temple buildings, many statues and sphinxes, and no less than fourteen obelisks. Tanis is undoubtedly the Biblical Zoan, which in Numbers xiii. 22 is said to have been built seven years later than Hebron, and it is identified by many Egyptologists with the city of Raamses, which the Israelites were obliged to fortify (Ex. i. 11). Consult: Petrie, *Tanis* (London, 1885-88); Budge, *A History of Egypt* (New York, 1902).

TANISTRY (from *tanist*, from Ir., Gael. *tanaiste*, lieutenant, lord, governor, heir apparent). An ancient Celtic law of succession, common to both Ireland and Wales, by which property or political power descended not to the children of the deceased, but to the oldest or most powerful of his collateral relatives. The rights thus transferred were felt to be vested rather in the tribe than in the individual.

TANJAY, tȧn-ʜī′. A town of Negros, Philippines, in the Province of Western Negros, situated 19 miles from Dumaguete (Map: Philippines, H 10). Population, in 1887, 10,293; now, 12,400.

TANJORE, tăn-jōr′. The capital of a district of Tanjore, in the Province of Madras, British India, 48 miles west of Negapatam, in the valley of the Kaveri River, one of the richest agricultural sections in India (Map: India, C 6). The large temple, dating from the eleventh century, is one of the finest examples of the Pagoda style of architecture in existence. There are several concentric rectangles, the outer measuring 415 by 800 feet. The leading architectural features are the great gopura, a pyramidal tower 200 feet high, and the handsome embellished shrine of Kartikeya. Another striking edifice is the palace of the Raja, constructed in 1550. It has many sculptures and pictures, together with a library containing valuable Sanskrit manuscripts. Schwartz's Church, the English Church, Saint Peter's College, the Prince of Wales Medical School, and People's Park are also of interest. Tanjore has manufactures of jewelry, carpets, copper utensils, and objects in repoussé work. Population, in 1901, 57,870. Tanjore was the capital of a Hindu principality until the overthrow of the Chola dynasty by the Mahrattas in 1678. During its early history it was one of the most important cities in Southern India. The English obtained control in 1799.

TANKAGE. A name applied to a product, used mainly for fertilizing purposes, which is prepared from the residue resulting from the treatment of abattoir and slaughter-house refuse with steam and hot water in closed tanks for the removal of fat, a process commonly known as 'tanking'. Tankage is variable in composition, depending upon the materials used in its preparation and the process of manufacture, but is generally rich in nitrogen, and it is this element which mainly determines its value as a fertilizer. According to Voorhees, two distinct kinds of tankage are ordinarily prepared: (1) concentrated tankage, containing from 10 to 12 per cent. of nitrogen with very small percentages of phosphoric acid; and (2) crushed tankage, of which there are several grades, containing from 4 to 9 per cent. of nitrogen, and 3 to 12 per cent. of phosphoric acid. Products containing more than 12 per cent. of phosphoric acid are known as bone tankage, and are properly classed with bone fertilizers (q.v.). The term tankage is also sometimes applied to the product obtained by drying, and in some cases partially charring, city garbage. This garbage tankage is more variable in composition and less valuable as a fertilizer than true tankage, although, like the latter, its value as a fertilizer depends mainly upon its nitrogen. The nitrogen of meat and bone tankage of good quality has been found to be about 60 per cent. as effective as plant food as that of nitrate of soda, which is taken as the standard. Tankage is therefore one of the most valuable sources of organic nitrogen for fertilizing purposes. Tankage is also beginning to be used with very promising results as a concentrated feeding stuff, especially for feeding hogs. When used in combination with corn it supplies the deficiencies, from a feeding standpoint, of that grain in protein and ash constituents and thus furnishes a better balanced ration.

TAN′NAHILL, Robert (1774-1810). A Scottish poet. He was the son of a silk weaver of Paisley. He was apprenticed to his father and passed most of his life in Paisley at the loom. He early showed a talent for verse and studied Burns, Fergusson, and Ramsay. He became an active member of a literary club at Paisley, for which he wrote some of his best songs. To a local Burns club he also contributed three remarkable birthday odes. As a song writer he possessed a spontaneity akin to that of Burns. Among his best songs, known throughout Scotland, are "Bonnie Wood o' Craigielee," "Sleepin' Maggie," "Braes o' Gleniffer," "Gloomy Winter's noo awa'," and "Jessie the Flower o' Dunblane." They all show a genuine lyrical gift, much tenderness of sentiment, and a true eye and feeling for the simple effects of nature. Suffering from melancholia, Tannahill drowned himself in a canal near Paisley. In 1874 the centenary of his birth was observed; and in 1883 a bronze statue was erected to his memory in the Paisley Abbey burying ground. Consult the complete edition of *Poems,* ed. Semple (Glasgow, 1873); selections in Miles's *Poets and Poetry of the Century* (London, 1891, et seq.).

TAN′NER, Henry Ossawa (1859—). An American historical painter. He was born at Pittsburg, Pa., the son of a bishop of the African Methodist Church, and studied in the Pennsylvania Academy of Fine Arts under Thomas Eakins. Later he went to Paris, where he remained, feeling there to a less degree his racial disadvantage. He studied under Jean Paul Laurens and Benjamin Constant; and in 1900 he was awarded the Lippincott prize at Philadelphia and a medal at the Paris Exposition. His pictures are landscapes and religious themes and in them he exhibits a Southern heartiness of emotion under a judicious restraint, a realism of presentation, and especially a rich mastery of color. His "Raising of Lazarus" hangs in the Luxembourg. The "Christ and Nicodemus" and the "Annunciation" are in Philadelphia, one in the Academy of Fine Arts, the other in Memorial Hall, Fairmount Park.

TANNER, Henry S. (1786-1858). An American geographer, born in New York City. He studied engraving and settled in Philadelphia, where, with his brother Benjamin, he established an extensive business in publishing maps, atlases, and geographical works. He became widely known as an authority on geography and was elected to membership in both the London and Paris Geographical Societies. His publications included: *New American Atlas* (1817-23); *Map of the United States of Mexico* (1825); *Map of Philadelphia* (1826); *Map of the United States of America* (1829); *View of the Valley of the Mississippi* (1832); *American Traveller* (1836); *Description of the Canals and Railroads of the United States* (1840).

TANNER, Thomas (1674-1735). An English antiquary, born at Market Lavington, in Wiltshire, where his father was vicar, and educated at Queen's College, Oxford. He was ordained deacon in 1694 and was appointed chaplain of All Souls' College in 1695. Besides various other preferments, he became canon of Ely (1713), canon of Christ Church, Oxford (1724), and Bishop of Saint Asaph (1732). He is known chiefly for *Notitia Monastica, or a Short History of the Religious Houses in England and Wales* (1695) and the *Bibliotheca Britannico-Hibernica,* a valuable account of the authors that flourished in the three kingdoms up to the seventeenth century (posthumous, 1748). With him Antony à Wood (q.v.) left additional 'lives,' which appeared in the second edition of *Athenæ Oxonienses* (1721). Tanner bequeathed a large body of manuscripts to the Bodleian Library at Oxford.

TANNERY, tà'ne-rē′, PAUL (1843—). A French scholar, born at Nantes. He was educated in the Paris Polytechnic School; engaged in the tobacco industry; and devoted his leisure time to studying the history of science and of philosophy. For two years he gave a course in the Sorbonne on the history of arithmetic, and for five years filled Professor Lévêque's chair in the history of Greek and Latin philosophy in the College of France. Aside from a great number of articles in periodicals and other publications, he published: *Pour l'histoire de la science hellène* (1887); *La géométrie grecque* (1887); *La correspondance de Descartes dans les inédits des fonds Libri* (1893); and *Recherches sur l'histoire de l'astronomie ancienne.*

TANNHÄUSER, tän′hoi-zẽr. A German knight and minnesinger of the thirteenth century, probably a Bavarian by birth, who enjoyed the favor of Duke Frederick II. of Austria. Little is known historically of his career, and he disappears entirely after the death of Conradin (1268). His verses are in the main mocking and sensuous. One of the latest of them, a penitential song, may have led to his identification with the hero of the old Teutonic legend of the Venusberg or Hill of Venus. This was a region within a mountain near the Wartburg, in the Thuringian Forest, where Venus reigned, and whence no one save Tannhäuser ever escaped. Here Tannhäuser, in the legend, lived with her until conscience smote him. He escaped, with the aid of the Blessed Virgin, and set out on a pilgrimage to Rome, to obtain pardon for his grievous sin. According to the story, Pope Urban IV. refused to pardon the sin until the staff in the Pope's hand should sprout. Tannhäuser returned to the Venusberg, but the wand meantime put forth green leaves by a miracle, to show the extent of the divine mercy. Modern versions of the legend were made by Tieck, Heine, and Geibel; and in Swinburne's *Laus Veneris* Tannhäuser is conceived as having returned irredeemably to the Venusberg. But better known than any is the famous dramatic treatment by Richard Wagner in his opera *Tannhäuser* (1845), whose libretto follows Hoffmann in identifying Tannhäuser with Heinrich von Ofterdingen and introducing him into the contest of the minstrels on the Wartburg. The works of the historic Tannhäuser were first edited by Von der Hagen in his *Minnesinger* (1848). For these consult: Oehlke (Königsberg, 1890) and Siebert (Berlin, 1894); for the legend, Baring-Gould, *Curious Myths of the Middle Ages* (London, 1884), and Grässe, *Der Tannhäuser und der ewige Jude* (2d ed., Dresden, 1890).

TANNIN (from *tan*, OF., Fr. *tan*, oak-bark for tanning, from OHG. *tanna*, Ger. *Tanne*, fir, oak; probably connected with Skt. *dhanvan*, bow), TANNIC ACID, GALLOTANNIC ACID, or DIGALLIC ACID, $C_6H_2(OH)_3COOC_6H_2(OH)_2COOH$. An odorless and almost colorless substance, soluble in water, alcohol, acetone, glycerin, and various oils, occurring in Turkish and Chinese gall-nuts and in various other plants. It has a bitter, astringent taste, and assumes a yellow coloration if exposed for some time to the action of light. It is used as an astringent in medicine and as a mordant in dyeing, and also finds employment in the manufacture of ink and of gallic and pyrogallic acids. Solutions of tannin reduce silver carbonate to metallic silver; they also reduce Fehling's solution (q.v.), and certain other substances, and precipitate gelatin and albumen from their solutions. On the other hand, solutions of tannin may be precipitated by the addition of various salts and acids, including common salt, sal ammoniac, the acetate as well as the sulphate of potassium, hydrochloric and sulphuric acids, etc. Tannin is made by extracting the powdered gall-nuts, which contain it in larger quantities, with a mixture of alcohol, ether and water; the layer of water then contains practically all the tannin; it is separated, purified by shaking with an excess of ether, and evaporated at a gentle heat. The residue thus obtained may be purified by dissolving in a dilute solution of common salt, and reprecipitating from this by adding an excess of salt in the solid state. With ferric salts tannin produces the well-known precipitate which is the coloring substance of ordinary black ink.

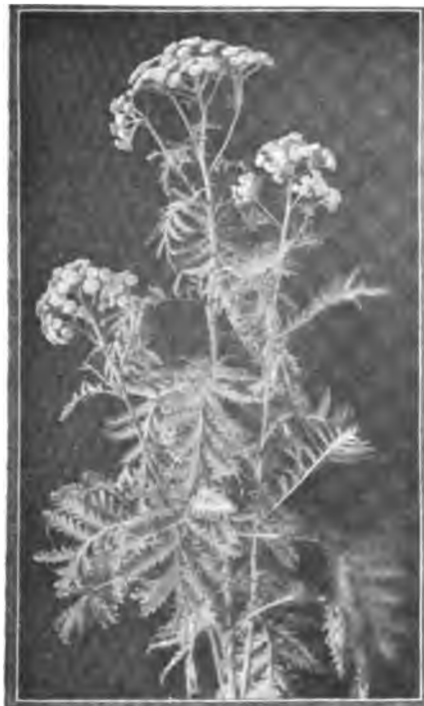
The names tannin and tannic acid are also applied to a variety of other substances of vegetable origin and having properties more or less similar to those of gallotannic acid: they are all astringent, transform hide into leather, give a blue or green coloration with salts of iron, etc. Some of the more important of these substances may be briefly noticed here under their special names.

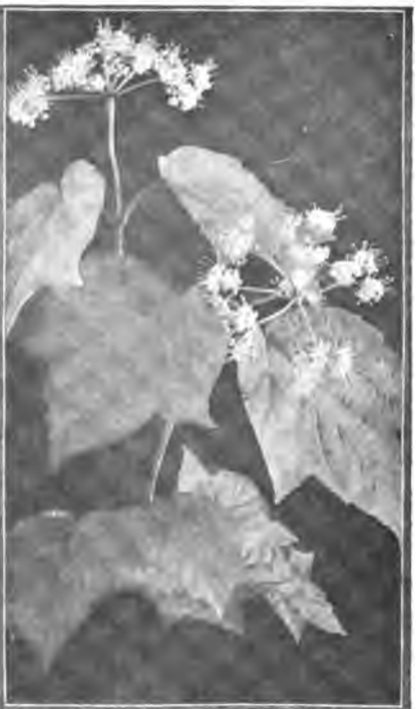
ALDER TANNIN, $C_{27}H_{28}O_{11}$. This is a reddish-brown substance soluble in dilute alcohol and quite soluble in hot water; its solutions give a green precipitate with ferric salts. It may be prepared by extracting sawdust from *Alnus glutinosa* with boiling water, precipitating the extract with lead acetate, and decomposing with sulphureted hydrogen; the precipitate, which now contains both the tannin and lead sulphide, is extracted with alcohol, and thus the tannin is isolated.

CAFFETANNIC ACID, $C_{15}H_{18}O_8$. This is found in coffee-berries and in certain other vegetable products. It is soluble in water and in alcohol and its solutions give a green coloration with ferric salts. It may be prepared by extracting coffee-berries with alcohol, diluting with water, filtering, boiling the filtrate and precipitating it with lead acetate; the precipitate thus obtained is shaken up with alcohol, in which it is caused to dissolve by decomposing with sulphureted hydrogen, and then the caffetannic acid is isolated by filtering and evaporating the solution to dryness.

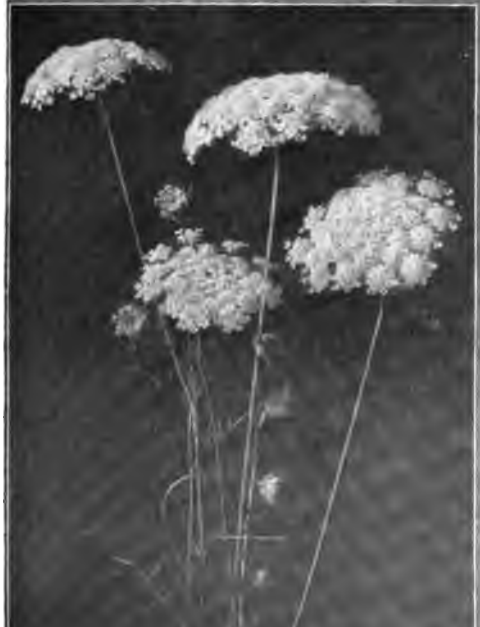
FRAXITANNIC ACID, $C_{26}H_{32}O_{14}$. This is found in the leaves of the ash-tree. From these it may be obtained by extracting with water, precipitating the extract with lead acetate, and dissolving the precipitate in boiling aqueous acetic acid. The tannin is then isolated by a somewhat elaborate process, involving fractional precipitation with ammonia, treatment of the purest fractions with sulphureted hydrogen, etc. (Consult *Monats-*

TANSY, ETC.

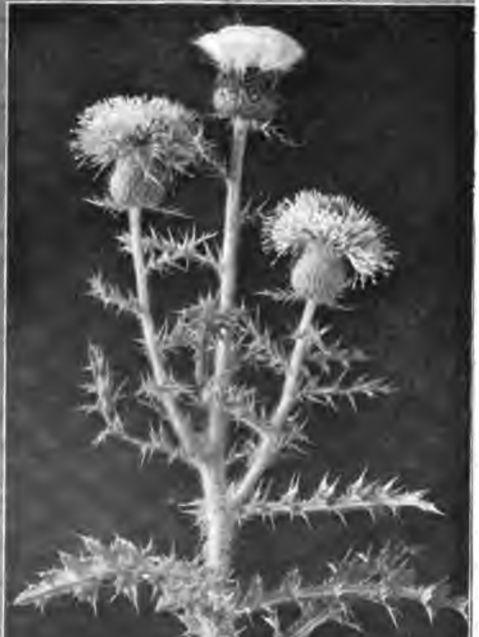

1


3

2



4



1. TANSY (Tanacetum vulgare).
2. WILD CARROT (Daucus Carota).
3. ARROW-WOOD (Viburnum acerifolium).
4. THISTLE (Cnicus lanceolatus).

hefte für Chemie, vol. iii., p. 745.) Pure fraxitannic acid is a golden-yellow powder, whose solutions give a dark-green coloration and precipitate with ferric salts.

Quercitannic Acid. This is a substance, or perhaps several very similar substances, of uncertain composition, found in the leaves, bark, and wood of the oak. It is also probably contained in tea. Extracts containing quercitannic acid are largely used in tanning. From these extracts the acid may be isolated by diluting with water, allowing to settle, filtering, precipitating the filtrate with hydrochloric acid, washing and drying the precipitate, dissolving it in strong alcohol, and mixing the alcoholic solution with somewhat more than an equal volume of water; the precipitate thus produced is rejected; on filtering, the liquid is evaporated to dryness, the reddish-white residue being practically pure quercitannic acid—a substance soluble in dilute alcohol and sparingly in cold water.

Quinotannic Acid, $C_{14}H_{16}O_9$. This is a light-yellow substance, found in cinchona bark. It is soluble in water, alcohol, and ether, and its solutions give a green precipitate with ferric salts. It may be prepared by extracting cinchona bark with water, adding burnt magnesia, filtering, precipitating the filtrate with lead acetate, decomposing the precipitate with aqueous sulphureted hydrogen, again filtering, precipitating this filtrate with basic lead acetate, dissolving the precipitate in dilute acetic acid, adding ammonia, treating this last precipitate with sulphureted hydrogen, and, finally, evaporating the resulting solution to dryness in vacuo.

Artificial Tannin. A number of substances similar in composition and properties to the natural tannins have been obtained synthetically by Löwe, Schiff, Böttinger, and others.

Consult: Trimble, *The Tannins; a Monograph on Their History, Preparation, etc. With an Index to the Literature of the Subject* (Philadelphia, 1892-94).

TANNING. See Leather.

TANN-RATHSAMHAUSEN, tän-rät′sȧm-hou′zen, Ludwig Samson, Baron von und zu der (1815-81). A German general, born at Darmstadt. He entered a Bavarian regiment of artillery in 1833, was transferred to the general staff in 1840, and, becoming aide-de-camp to Crown-prince Maximilian in 1840, was soon afterwards promoted to the rank of major. In 1849-50 he took a conspicuous part in the Schleswig-Holstein campaign, and after his return to Bavaria was again aide-de-camp to King Maximilian, was made major-general in 1855 and commanding general at Augsburg in 1861, and subsequently at Munich. In 1866 he was chief of staff of Field-marshal Prince Charles, commander-in-chief of the South German contingents, and having been appointed general of infantry and commander of the first army corps in 1869, led it with distinction in the campaign of 1870, at Wörth, Beaumont, and Sedan. Given command over the combined forces operating on the Loire, he reduced Orléans, afterwards fought victoriously under the Grand Duke of Mecklenburg in several bloody engagements and rejoined the besieging forces before Paris. For his biography consult Helvig (Berlin, 1882) and Zernin (Darmstadt, 1883).

TANREC. See Tenrec.

TANSILLO, tȧn-sĭl′lō̇, Luigi (1510-68). An Italian poet, born at Venosa, province of Potenza. He early entered Court service and in 1535 became one of the bodyguard, formed of one hundred nobles, of Don Pedro de Toledo, the Spanish Viceroy of Naples, with whom and with whose son, Don Garcia, he stood in great favor. He accompanied them on their expedition against the Turks and fought with conspicuous bravery. Subsequently he held the post of Capitano di giustizia at Gaeta and died at Teano. His ingenious but rather lubrical poem *Il vendemmiatore* (1534, trans. by Mercier as *Jardin d'amour*, 1798) established his literary reputation, but was the cause of all his writings being placed on the Index by Paul IV. To atone for it, Tansillo afterwards resumed his religious epic *Le lagrime di San Pietro*, begun in 1539, but left it unfinished. Of his didactic poems *La balia* (trans. by William Roscoe) and *Il podere*, the latter is one of the best of its kind in Italian literature. His lyrics, inspired by his impassioned love for a high-born lady, are replete with fervor and fine descriptions of nature. In the *Stanze a Don Pedro di Toledo* (1547) he depicts with consummate art the luxurious gardens of the Viceroy by the sea. An edition of *Poesie liriche edite ed inedite*, with biography and commentary by Fiorentino, appeared at Naples (1882); also *Capitoli giocosi e'satirici*, ed. by Volpicella (ib., 1870).

TANSY (OF. *tanasie, tanesie, tanaisie, tanasie*, Fr. *tanaisie*, Sp., Port., It. *atananasia*, from ML. *athanasia*, tansy, from Gk. ἀθανασία, immortality, from ἀθάνατος, *athanatos*, immortal, from ἀ-, *a-*, not + θάνατος, *thanatos*, death, from θνήσκειν, *thnēskein*, to die), *Tanacetum*. A genus of plants of the natural order Compositæ, natives of the temperate parts of the Old World.

TANSY.

Common tansy (*Tanacetum vulgare*), a perennial, has long been cultivated in gardens and is naturalized in many parts of North America.

The deep green leaves and yellow flowers have a strong aromatic smell and a bitter taste. The leaves contain a volatile oil and the younger ones have been used for flavoring puddings, cakes, omelets, etc., and were formerly used in medicine, but are rarely used even in domestic practice. Some curious Easter customs linger in many parts of England connected with the use of tansy cakes and puddings which were originally intended to represent the use of bitter herbs at the paschal feast. See Chambers's *Book of Days*.

TANTA, tän'tȧ, or **TANTAH.** The capital of the Province of Gharbieh, Lower Egypt, situated in the Delta, about 60 miles north of Cairo (Map: Egypt, E 2). It has a palace of the Khedive and a fine mosque, and is noted for its fairs and festivals, which are visited by thousands of Moslem pilgrims and traders. Population, in 1900, 35,000.

TANTALITE (from Neo-Lat. *tantalum*, tantalum). A mineral iron tantalate crystallized in the orthorhombic system. It has a submetallic and often brilliant lustre, and is brown to iron-black in color. It occurs in granitic and feldspathic veins in the form of crystalline granules and cleavable masses, and is found in Finland, Bavaria, Italy, Western South America, and Greenland, and in the United States at various localities along the Appalachian Mountain system, in Colorado, and in the Black Hill region. The iron in this mineral is frequently replaced by manganese, giving rise to a variety known as *manganotantalite.*

TANTALUM (Neo-Lat., from Lat. *Tantalus*, father of Niobe; so called from its close resemblance to the metal niobium). A metallic element discovered by Ekeberg in 1802. It occurs associated with columbates in the rare minerals columbite, tantalite and yttrotantalite. Its separation is by a long and complicated chemical method, and the product obtained is believed to be an impure mixture of oxides. Tantalum (symbol, Ta; atomic weight, 182.84) is a black powder that assumes an iron-gray metallic lustre under a burnisher, and when gently heated ignites in the air and burns, forming the oxide. It also combines with oxygen to form a pentoxide, which in turn combines with bases to form a series of salts called *tantalates.*

TAN'TALUS (Lat., from Gk. Τάνταλος). In Greek legend, King of the region about Mount Sipylus in Lydia, son of Zeus and father by Dione of Pelops (q.v.), Broteas, and Niobe (q.v.). He was a favorite of Zeus and was admitted to the gatherings of the gods, but offended grievously in some way and was in consequence visited with extreme punishments, so that he became one of the typical figures in Tartarus. There Tantalus was plunged into a deep pool, whose waters receded whenever he stooped to drink, while over his head hung clusters of fruit which were ever kept just beyond his reach. Another version represented him as poised in the air, beneath a huge rock which constantly threatened to fall and crush him.

TANTIA TOPI, tän'tē-ȧ tō'pē (c.1812-59). An Indian military commander, conspicuous in the Sepoy mutiny of 1857-58. He was born at Bithur, near Cawnpore. He became the chief lieutenant of Nana Sahib (q.v.) in 1857. After the defeat of Nana Sahib by Havelock, Tantia Topi conducted the campaign alone until the flight of his superior into Oudh and Nepal made communication impossible. He then acted under the orders of Rao Sahib, nephew of Nana Sahib. It was due to his generalship alone that the rebellion continued after the capture of Gwalior by Sir Hugh Rose and the death of the Rani of Jhansi, in June of 1858. For nine months he baffled the English in Central India, suffering his first serious reverse at Sikar in January, 1859. The rebels were finally dispersed in March, 1859, and Tantia Topi, who had taken refuge in the jungles of Paron, was betrayed (April 7) to Major Meade by his own friend and late associate Man Singh. He was tried by court martial at Sipri and hanged there on April 18, 1859.

TANTRA, tän'trȧ (Skt., ceremony, woof, from *tan*, to stretch, to weave). The Sanskrit term for a ceremony or a ceremonial treatise, and thus for a systematic treatise of any kind. The word is used in English, however, only as the designation of a late class of Sanskrit works which are related to the Puranas (see PURĀṆA) on the one hand, and to the magic literature in general on the other (see the section *Atharvaveda* under VEDA). The Tantras are in the main the sacred works of the worshipers of the androgynous Siva (q.v.), or of Sakti, the female principle itself (see SAKTAS). They deal with the creation and destruction of the world, the worship of the gods, the attainment of all objects, magical rites for the acquirement of six superhuman faculties, and four modes of union with spirit by meditation. Prayers to the gods, especially Siva, some few of great beauty, are comparatively rare. Their place is taken by a condensed form of invocation of the divinity by means of a great variety of honorific epithets, one class, the 'thousand-name prayers,' forming a division by itself. There are also prayers in the form of amulets, which contain magic and invocation in their very form, and are therefore regarded as especially efficacious. Numerous other subjects are introduced into many Tantras, while certain ones are limited to a single topic, as the mode of breathing in certain rites, or the language of birds and beasts. Siva and his wife, Devi, Uma, or Parvati, are the chief divinities of the Tantras, which are nearly always composed in the form of a dialogue between them, in which the goddess questions the god as to the mode of performing various ceremonies, and the *mantras* or prayers and incantations to be used in them. These he explains at length, and under solemn cautions that they involve a great mystery, not to be divulged to the profane. The followers of the Tantras consider them as a fifth Veda, and attribute to them corresponding antiquity. This claim is entirely imaginary; they are mentioned in some of the Puranas, and are probably later than the lexicographer Amarasinha (q.v.), who lived several centuries after the beginning of the Christian Era. No less than sixty-four Tantras are mentioned by the Hindu commentator Sankara (q.v.), yet this important branch of Sanskrit literature has been scarcely studied by Western scholars, nor is there, even in India, any edited text or translation of a single work of this class.

TANTUM ERGO. The last two stanzas of the hymn *Pange lingua*, which are invariably sung at benediction in the Roman Catholic Church.

TANZIMAT, tän-zē′mȧt (Ar. *tanẓimat*, pl. of *tanẓim*, regulation, inf. of second form of *nazamȧ*, to arrange in order). The organic laws in accordance with which the administration of the Turkish Empire is in theory carried on. They were the result of the reform movement introduced by Mahmud II. The organic laws, known as the *hatti sherif* of Gulhane, were promulgated on November 3, 1839, by Mahmud's son, Abdul Medjid (q.v.), soon after his accession. They established the equality of civil rights for all subjects, limited the power of the Government officials, guaranteed the free practice of religion, and introduced radical reforms in the administration of finance, justice, and the army. In 1856 the Sultan found it necessary to publish a new ordinance, in which the complete carrying out of the Tanzimat in all respects was commanded. Other attempts in 1868 and 1876 to make the Constitution effective were unsuccessful. Consult Engelhardt, *La Turquie et le Tanzimat* (Paris, 1882-84). See TURKEY.

TAOISM, tä′ō-ĭsm (from Chin. *tao*, path, way, proper method, word, principle, reason). A religion in China which must have existed there since prehistoric times and has even at present a very strong hold upon the people. The term *tao* itself is clothed with a religious awe and always spoken of with great veneration, although it is frequently used in general literature in the sense of rationality, common sense, and sound judgment. The Taoists, called *Tao-Sse*, or teachers of the *Tao*, are a religious fraternity with temples, sacred books, and a definite ritual. Their most sacred book is "The Canon of Reason and Virtue" (*Tao-teh-King*), written by Li Urh, commonly called Lao-Tse (q.v.). It is a short treatise of about five thousand characters, but full of profound wisdom and sound ethics.

There must have been Taoism, however, before Lao-Tse, for he does not regard himself as the founder of a new faith, but quotes in his book many sayings of his predecessors and claims only to expound the obscure wisdom of the ancient sages. Apparently he refers to the popular traditional religion that existed at his time in China. The difference between Confucianism and Taoism corresponds to the respective characters of the two reformers. Confucius was an aspiring moral teacher and in the prime of life, while Lao-Tse was famed for his wisdom and about half a century the senior of Confucius. The ambition of Confucius was to educate the nation by teaching the people propriety, while Lao-Tse despised all externalities and ceremonies, insisting simply and solely on a regeneration of the heart. The moral doctrines of Confucianism rest upon the recognition of authority under the name *Hsiao* (filial piety), establishing in matters of government the principle of paternalism, but Taoism condemns all interference with the natural course of things and thus all statecraft, especially any and every rule by force, as contrary to the *Tao*, and preaches boldly the maxim of *laisser-faire*. In a sense Confucianism remained victorious, for it became the officially recognized doctrine of China and the mandarins are all Confucian scholars. The two greatest disciples of Lao-Tse and the ablest expounders of Taoism were Lieh-Tse and Chwang-Tse, the former of the fourth and the latter of the third century B.C. The one is more metaphysical and speculative, the other popular and witty. Especially Chwang-Tse is very severe on the 'literati,' and does not shrink from ridiculing their great master, Confucius. Taoist ethics are best represented in the *Kan-Ying-P'ien*, or "Book of Rewards and Punishments," a production of the fifteenth century. It first came into prominence in the sixteenth century, when it was incorporated in the *Tao-Chang*, a collection of Taoist scriptures. It contains 212 moral maxims illustrated by stories and references to the history of the earlier Ming dynasty (A.D. 1368-1644). The distribution of this book is deemed a religious duty, and innumerable editions are published at the expense of pious Taoists. Among the great men who were professed Taoists, Chang-Liang (died B.C. 189) deserves special mention for the important part he played in history as a councilor of Liu Pang, the founder of the Han dynasty. Taoist legends attribute to him supernatural wisdom and tell of him many marvelous occurrences.

The word Taoism might be translated 'Rationalism,' were it not for the mystic tendencies of its adherents. Lao-Tse, Lieh-Tse, and Chwang-Tse are sometimes obscure, but they remain as sober as the transcendentalists of the nineteenth century. All later Taoists, however, are mystics. Either they claim to be in possession of magic powers, or are engaged in alchemy and other occult studies. One of them, Shang-Tao-Ling, became the recognized leader of the Taoist fraternity. He was said to have compounded and swallowed the elixir of life, whereupon he ascended visibly to heaven. He bequeathed his secrets to his descendants, thereby establishing an hereditary Taoist papacy. The head of the fraternity is regarded as the vice-gerent of God on earth and bears the title 'The Pearly Emperor of Heaven.' Through a host of priests and the great wealth at his disposal, he exercises an immense power throughout China, which the Imperial Government is bound to respect.

The Taoist priests of to-day know very little of Lao-Tse. They attend to the spiritual needs of the people, which are not very high. They tell fortunes, determine lucky and unlucky days, and regulate popular feasts. For divination, they use the Kwa, a system of trigrams of broken and unbroken lines which are determined with Shih sticks (see PAK-KWA), and for the determination of days they use an astrological device, called *lo-pan*, or table of the net, because it resembles a cobweb, in which certain symbols are arranged in concentric circles round a compass.

Consult: Julien, *Khan-Ing-Pien, Le livre des récompenses et des peines* (Paris, 1835); id., *Lao-tseu-Tao-Te-King, Le livre de la voie et de la vertu* (ib., 1842); Carus, *Lao-tze's Tao-teh-King* (Chicago, 1898); Douglas, *Confucianism and Taoism* (London, 1879); Legge, *Religions of China* (ib., 1881); id., "Texts of Taoism," in Müller, *Sacred Books of the East*, vols. xxxix., xl. (Oxford, 1891); Balfour, *Taoist Texts, Ethical, Political, and Speculative* (London, 1885); Harlez, *Textes Tâoïstes* (Paris, 1891); Rosny, *Le Taoïsme* (ib., 1892).

TAO KWANG, tou′ kwäng′ (1781-1850). The reign-title of Mien-ning, the sixth Emperor of the present Manchu dynasty of China. He came to the throne in 1820. The first years of his reign were comparatively tranquil, but disturbances and insurrections soon occurred in Turkestan, in Hainan, in Formosa, and in Kwang-tung. In 1834 the privileges of the British East India Company were abolished, and the misunderstandings which then arose, combined with the high-handed proceedings of Commissioner Lin, led in 1839-40 to war with Great Britain, the defeat of the Chinese, and the negotiation of the Treaty of Nanking in 1842. This treaty provided for the opening of Shanghai, Ningpo, Foochow, and Amoy besides Canton to foreign residence and trade, the cession of Hong Kong to Great Britain, and the payment of an indemnity of 21,000,000 taels, equal at that time to about $35,000,000. This large payment in addition to the costs of the war, coming on an impoverished treasury, created much discontent among the people, the secret societies became active, and swarms of pirates harassed the Government. Tao Kwang died in 1850, and was succeeded by his fourth son, who reigned as Hien Fung (q.v.).

TAORMINA, tä'ôr-mē'nȧ (Lat. *Tauromenium*). A town in the Province of Messina, Sicily, 30 miles by rail southwest of the city of Messina (Map: Italy, K 10). It is majestically situated on a rocky terrace 390 feet above the Ionian Sea, but is overhung by the ruins of the castle (1300 feet above the sea), and again to the northwest by Mola (2080 feet) and by Mount Venere (2834 feet). The theatre, founded by the Greeks, rebuilt by the Romans, and wrecked by the Saracens, was partially restored in 1748, and is of great interest. The ancient city was named after Mount Toro (ancient Taurus), on whose slope it lay, and was founded by the Siculi in B.C. 396, after the destruction of Naxos, near by, which was the oldest Greek colony in Sicily, having been founded in B.C. 735. Under the Roman Empire it was a city of importance. On account of its strong position, it was long able to keep out the Saracens, who finally captured it in A.D. 902, killed the people and burned the buildings. Being resettled, it was, in 962, again captured by the Saracens, from whom it was taken in 1078 by the Normans. Consult: Squillaci, *Taormina attraversi i secoli* (Catania, 1892). Population (commune), in 1881, 3128; in 1901, 4351.

TAO-TAI, or **TAU-TAI**, tou'tī'. A Chinese official who has the general supervision and control of the affairs, both civil and military, of a *tao* or 'circuit,' and usually styled by foreigners the 'Intendant of Circuit'—a circuit consisting of two or more fu or departments. A foreign commissioner of customs ranks with the tao-tai, and all foreign consuls have the rank of tao-tai.

TAPAJOS, tȧ-pä-zhôs'. A south tributary of the Amazon, flowing entirely within Brazil (Map: Brazil, F 4). It rises in the western part of the State of Matto Grosso, near the Bolivian frontier, and flows north and northeastward till it enters the Amazon at Santarem after a course of about 1100 miles. Its sources are on a low and flat divide which separates its basin from those of the Paraguay and the Guaporé. The upper course lies on the great Brazilian frontier, from which it descends to the forest plains of the Amazon in a series of falls and rapids which completely obstruct navigation. The last 200 miles only are navigable for large vessels. Near its mouth it expands into a large lake 70 miles long and 12 miles wide, but contracts again just before entering the Amazon.

TAPE GRASS, **EEL GRASS**, **WILD CELERY.** Popular names for Vallisneria spiralis, an aquatic grass-like plant which grows in slow waters, being common from New England to Minnesota and south to Florida and Texas.

TAPESTRY (ME. *tapecery*, *tapecerye*, from OF. *tapisserie*, tapestry, from *tapisser*, to furnish with hangings, from *tapis*, tapestry, carpet, from ML. *tapetium*, from Gk. ταπήτιον, diminutive of τάπης, *tapēs*, figured cloth, tapestry). A decorative textile fabric formed by a process intermediate between embroidery and true weaving. It differs from embroidery in that the design is not applied to an existing fabric, but, by being woven in and out of warp threads, forms a part of the fabric. It differs from ordinary weaving in that the filling thread, instead of being shot back and forth continuously with a shuttle through a shed formed by the heddles (see WEAVING), is worked in and out a few stitches at a time with a thread held in the hand. Tapestry weaving is the simplest and appears to have been the earliest form of weaving. The Saracens introduced it into Europe, and for a long time the fabric was called *Sarrazinos*.

Toward the end of the twelfth century tapestry weaving was begun in Flanders and Artois, and here it was continued for many centuries. The productions of Arras, in particular, became so famous, both for quality and numbers, that the name of the town was given to the fabric.

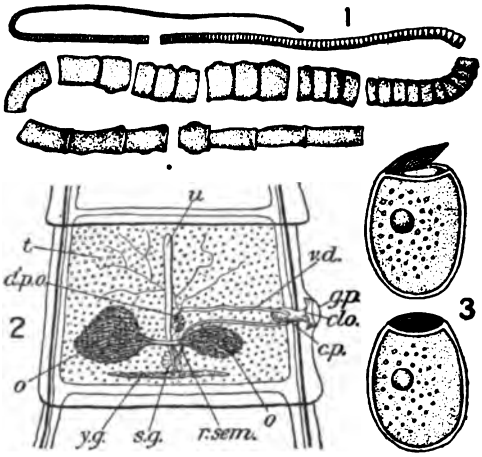
Tapestries were, during the Middle Ages, produced chiefly for State and ecclesiastical purposes and for the decoration of royal palaces. They were used as curtains, wall-coverings, and less frequently as coverings for tables, beds, and floors. The scenes portrayed on them were usually based on Scriptural stories or historical events. The famous *Bayeux tapestry* (q.v.), which, by the way, is not true tapestry at all, but embroidery, was contemporaneously executed to record the events connected with the conquest of England by William of Normandy.

The Saracenic tapestries were ornamented with flowers and geometric figures only, but the Flemish people sought to enrich them with historic subjects. So important did this art become that the most eminent masters in painting, from Raphael downward, bestowed some of their greatest efforts upon cartoons to serve as copies for the tapestry-workers. After its introduction into France by Henry IV. at the beginning of the seventeenth century, the art of making tapestry does not appear to have made much progress until the middle of that century, when a small establishment founded by the brothers Canaye on the premises formerly occupied by Jean Gobelin, a Parisian dyer of wool, was commenced. It was afterwards carried on by a Dutchman named Gluck and his assistants with such success that it was suggested by Colbert, the minister of Louis XIV., that it should be taken under the King's patronage; in consequence of which the establishment was bought, and constituted a royal manufactory in 1667, under the management of M. Lebrun, who was the first director. A royal carpet manufactory had been previously established in 1615; this was called La Savonnerie, from the previous use of the buildings for the manufacture of soap. The Savonnerie and the Gobelin factories were both carried on with great spirit by successive sovereigns. They were formed into one establishment in 1826, when the works of the Savonnerie were removed to the Gobelins. During the seventeenth century two other royal factories were established, one at Beauvais and one at Aubusson, and these factories are still maintained by the State. In 1619, during the reign of James I., tapestry looms were set up at Mortlake, England, and during the following reign were under the direction of the painter Francis Crane. Charles I. introduced skilled weavers from Belgium. This factory was closed in 1703. In 1872 another royal factory was established in England, this time at Windsor, but it was closed in 1888.

Two kinds of looms are used in making tapestry: The high-warp vertical looms (*haute lisse*) and the low-warp horizontal looms (*basse lisse*). The former is the kind upon which the finest tapestries are woven and is used exclusively in the Gobelins. In the high-warp loom two uprights of wood or iron support two movable cylinders (*ensouples*), one at each end, on which the warp threads are stretched at will. The weaver works at the back of the loom, where the design is sketched on the warp threads. He places the cartoon behind him, using it to get the design and to match his colors. Occasionally he steps around to the front to get the effect on the right side. The threads are woven in and out like basketwork, a little patch of color at a time, the different colors being wound on different spindles. Each distance must be traversed twice, as only alternate threads are covered on the right side. Thus tapestry is a double cloth. When the thread has been woven only one way it is called a *half-pass;* when it is turned and woven back the other way, completing the covering of the warp, it is called a *woof*. When the weaver has finished using a given color he does not break the thread, but leaves the spindle hanging at the back till he shall require the same color again. It will readily be seen that in the vertical lines of a design, in weaving the colors, open slits will be left which must be afterwards sewed together. For this reason many of the Oriental tapestries have no lines running in the direction of the warp, but only zigzags. On the low-warp looms the threads are moved by heddles, connected with treadles, leaving both hands free for the work. Hence the work can be done more rapidly; but it is not as satisfactory, since the workman can see it but imperfectly till it is completed.

Most tapestries are made of wool on cotton warp. Silk and gold and silver threads are also used to heighten the effect. The dyeing of the multitudes of tints required in this work is in itself an art requiring no little skill. Consult: Muntz, *Short History of Tapestry*, trans. by Davis (London, 1885); also Cole, *Tapestry and Embroidery* (ib. 1888).

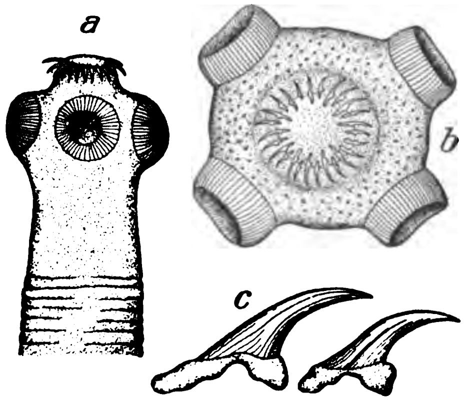
TAPEWORM. Any worm of the group Cestoda, but popularly used for the Tæniidæ or the Bothriocephalidæ. Nearly 200 species of cestoid worms have been described, of which the majority fall into one of the two families just named. (See CESTODA.) These worms have no intestine, and are without cilia, but have testes and ovaries in each segment, together with frequent yolk-glands. They belong to the order Polyzoa or segmented individuals. They are all endoparasites, and secure nutrition from the digestive tract of the host in which they live, absorbing digested food through their body walls.



TAPEWORMS.

1, *Tænia saginata*; 2, segment of *Tænia solium* (showing generative organs): *u*, uterus; *t*, testes; *o*, ovary; *d.p.o.*, detached portions of ovary; *y g.*, yolk gland; *s.g.*, shell gland; *r.sem.*, receptaculum seminis; *v.d.*, vas deferens; *g.p.* genital papilla; *clo.*, cloaca; *c.p.*, cirrhus pouch; 3, lidded ova of *Bothriocephalus latus*.

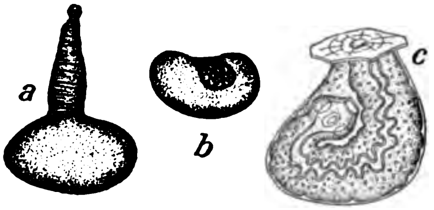
TÆNIA. A tænia consists of a scolex, or head, and detachable segments, or proglottids. Within the scolex is the brain; on the outer surface of the scolex are four sucking disks as well as a ring of hooks. Fixation is secured through the suckers and hooks. In each proglottid is an albumin gland; and a uterus and a vas deferens end in openings on the side of the proglottid. New proglottids grow behind the head, by division of its posterior part. The farther from the head, the larger is the proglottid. The distal proglottids separate from time to time and are excreted with the fæces of the host. But the head must be removed to secure freedom from the parasite.



TAPEWORMS.

a, head of *Tænia solium*; *b*. apical surface and circle of hooks of *Tænia solium*; *c*, hooks of *Tænia solium*—larger, anterior; smaller, posterior.

The embryonic stages of tapeworm are hydatids (measles, cysticerci) or *cysticercoidi*. When a *Tænia ovium* with mature embryo is swallowed and reaches the human intestine, it migrates through the blood-vessels or lymphatics into the tissues and develops into a hydatid. Both in man and in the pig the embryo of *Tænia solium* becomes a measle; while the embryo of *Tænia saginata* becomes, similarly, a measle in the cow.



BLADDER WORMS OF PIG.

a, *Tænia solium* (evaginated head); b, *Tænia solium* (invaginated head); c, *Cysticercus cellulosæ* (head formation completed).

If a cysticercus be ingested by a man, it develops in his intestine into a complete tænia. In the human digestive tract a *Cysticercus cellulosæ*, or bladder worm, obtained from measly pork, becomes a *Tænia solium* in six to ten weeks. The *Tænia canina* develops in man from a cysticercoid of the cutaneous parasites of the dog. *Tænia solium* was so named by Linnæus because it is generally found alone; but in many instances two or three are found together, and in rare instances as many as 30 or 40 have been expelled from one patient. The full grown tænia or *strobila* is from 10 to 35 feet in length, and may consist of from 800 to 1000 proglottids. The sexually mature proglottids begin at about the four hundred and fiftieth segment. The breadth of the worm is about one-third of an inch at the widest. The head is very small and globular, or pear-shaped, is about the size of a small pinhead, and is dark with pigment. The crown of hooks numbers about 22 to 28 in each double row. The neck is very narrow and about one-half of an inch in length, and merges into the wider, segmented part. The impregnated eggs, when discharged into the intestine, do not mature there. They require the second host; such as, for example, the pig, who eats the expelled proglottids or the ova. The exception to this general rule is met when a cysticercus is found together with a tapeworm in a human digestive tract. This is, necessarily, a source of grave danger, for the cysticercus may traverse the body as it does in the hog, and cause threatening or fatal conditions. Hence the imperative necessity of securing the expulsion of the entozoa as soon as their presence is known. When fully mature, the measle resembles a pea or a small kidney bean, being about one-third of an inch in diameter. Its great vesicular portion consists of a caudal extremity, inflated like a bladder, while the head, neck, and body may be drawn out in vermiform style.

The great source of tapeworm is measly pork, eaten uncooked, or but partly cooked. The preventive is to have pork, ham, bacon, and sausage always very thoroughly cooked. It is also possible to ingest the embryo of the tapeworm with lettuce or other uncooked green food which has grown where a filthy stream flows over it, or which has been watered with liquid manure. Very scrupulous washing will prevent danger in these vegetables.

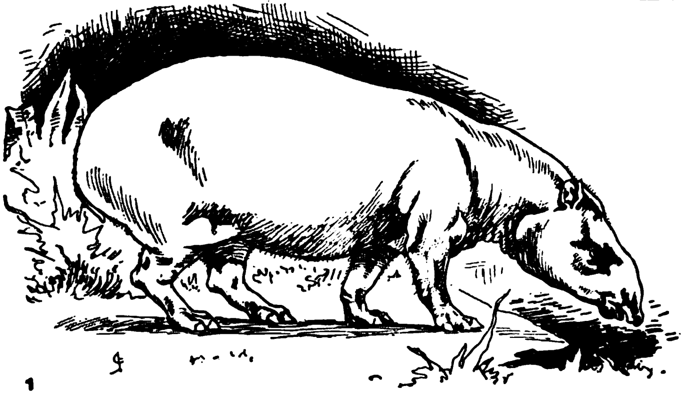
Tænia saginata (or *mediocanellata*) has no circle of hooklets and is about 25 feet in length. In its case, cattle instead of hogs constitute the intermediary hosts. It is transmitted through imperfectly cooked veal or beef. *Tænia echinococcus* is, in its larval condition, probably more fatally injurious to the human race than all the other species of entozoa put together. In its mature (strobila) condition, in which it is found only in the dog and wolf, it seldom exceeds the fourth of an inch in length, and develops only four segments, including that of the head. The final segment, when sexually mature, equals in length the three anterior ones, and contains as many as 5000 eggs. The proscolex or embryo forms large proliferous vesicles, in which the scolices or larvæ (known also as acephalocysts, echinococci, echinococcus heads or vesicles, pill-box hydatids, etc.) are developed by gemmation internally. The eggs develop in their interior a six-hooked embryo, and these embryos are introduced into our bodies with food or water into which the eggs have been carried. It finds its way into the liver, and later is carried by the blood current to other organs, including the lungs, the kidneys, the brain, and the bones. It grows slowly, many months elapsing after the ingestion of tapeworm eggs or embryos before the echinococci appear.

In some countries in Europe hydatids are very prevalent. It is reported that the disease is endemic in Iceland to such an extent that one-sixth of the population suffer from it. The cause may be found in the great number of dogs harbored by the Icelanders. *Tænia saginata* is increasingly frequent in France, England, Italy, and Germany, as well as in Abyssinia, Senegambia, Algeria, and the Cape Colonies, Syria, Siberia, the East Indies, and the Punjab. It is claimed by investigators that it (and not *Tænia solium*) is the common tapeworm in North America, as well as in Brazil, Peru, and the Argentine Republic.

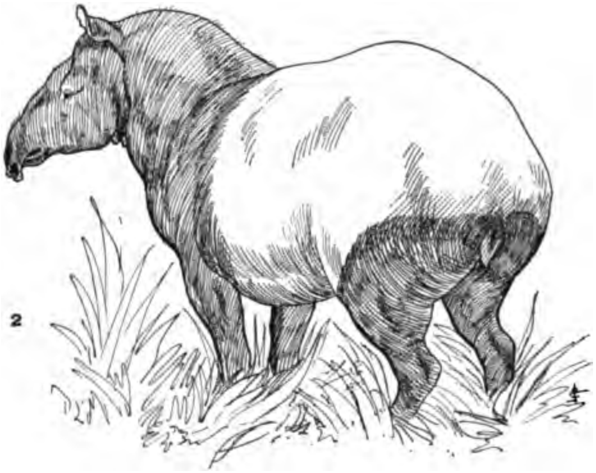
The presence of a tapeworm in the intestines may be suspected only from the occurrence of pieces of the entozoön in the dejecta, resembling flat segments of macaroni. But in most cases it gives rise to a series of anomalous symptoms, including vertigo, noises in the ears, impairment of sight, itching of the nose and anus, salivation, dyspepsia, and loss of appetite, colic, pains over the epigastrium and in different parts of the abdomen, palpitation, syncope, the sensation of weight in the abdomen, pains and lassitude in the limbs, and emaciation. In the treatment of tænia, prophylaxis is important. All meat must be so thoroughly cooked that the centre of each piece is subjected to great heat. Beef is the principal host of the entozoön. Rare beef must therefore be avoided. The medicinal treatment consists in causing the patient to fast for twenty-four hours and then administering the oleoresin of *Filix mas* (male fern), which must be followed by a brisk calomel purge. Santonin is also a reliable anthelmintic. The head must be sought in the excrement of the patient and medication must be repeated till the head is evacuated.

Tapeworms, although rare among horses and cattle, are common in dogs and sheep, causing irritability of the bowels, and an unthrifty ap-

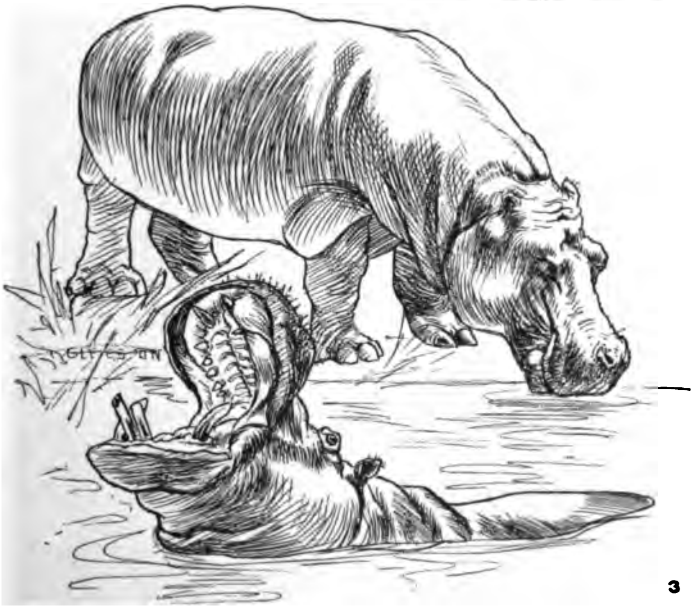
TAPIRS AND HIPPOPOTAMUS



1



2



3

1. AMERICAN TAPIR (Tapirus Americanus). 2. MALAYAN TAPIR (Tapirus Indicus).
3. HIPPOPOTAMUS (Hippopotamus amphibius).

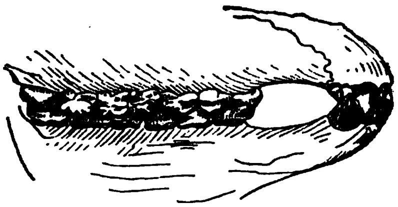
pearance. For dogs no remedy answers so well as powdered areca nut, of which 30 grains suffice for a dog weighing about 20 pounds. It is best given after ten or twelve hours' fasting, in a little soup or milk, and should be followed in a few hours by a dose of castor oil. Neither areca nor any of the approved remedies used in men prove effectual in sheep; and one of the best prescriptions for them consists of 40 drops of oil of turpentine, a dram of powdered green vitriol, and an ounce of common salt, given mixed in a little milk or gruel, or, where their bowels are confined, in linseed oil. A daily allowance of linseed cake and sound dry food should likewise be given with the grass or roots, and pieces of rock salt left within the animal's reach.

Among other varieties of tæniæ are *Tænia cucumerina*, which infests the dog and cat, and whose cysticercus is harbored by the flea; *Tænia nana*, which is the smallest tapeworm found in man, and which is frequent in Egypt and Sicily; and *Tænia diminuta*, first seen in Italy, rarely found in man. The last named infests rats and mice, and its cysticercus inhabits caterpillars and certain of the Coleoptera. The largest tapeworm, rare in America, but common in Central and Eastern Europe, is *Bothriocephalus latus*. It is sometimes 25 feet long, nearly an inch broad and with 4000 joints.

Consult: Cobbold, *Entozoa* (London, 1864), and *Parasites* (London, 1879); Braun, *Die thierischen Parasiten des Menschen* (Würzburg, 1903).

TAPIOCA. See CASSAVA.

TAPIR (Sp. *tapiro*, from Tupi Brazilian *tapyra*, tapir). A tropical ungulate mammal of the family Tapiridæ, allied to the horses and rhinoceroses. It has a bulky form, with moderately long legs; the front feet four-toed, the hind feet three-toed; the skin thick, the hair short; the tail very small; the neck thick; the ears short; the eyes small; the muzzle elongated; the nose prolonged into a short, flexible proboscis; 6 incisors, 2 canine teeth, and 14 molars in each jaw. The family includes only five living species, with a very peculiar geographical distribution, as two species are found in South America, two in Central America, and one in the Malayan region. The best known is the 'American' tapir (*Tapirus Americanus* or *terrestris*), which is about the size of a donkey, and is common throughout the wooded parts of South America, east of the Andes. Its color is uniform deep brown, but the young (as is the case with the other species) are beautifully marked with yellowish fawn-colored stripes and spots. The skin of the neck forms a thick rounded crest on the nape, with a short mane of stiff hair. The tapir inhabits deep recesses of the forest, and delights in plunging and swimming in water. It feeds chiefly on young shoots of trees, fruits, and other vegetable substances, and sometimes commits great ravages in cultivated grounds. It is inoffensive, never attacking man; but when hard pressed by dogs, shows great cunning, and if brought to bay, makes a violent resistance, and inflicts severe bites. It is very easily tamed, and becomes extremely familiar. Its hide is useful, and its flesh is eaten.



DENTITION OF A TAPIR.

The hairy tapir (*Tapirus Roulini*) occurs only on high levels on the Andes, up to 7000 or 8000 feet. The skin is uniformly covered with hairs an inch long. There are white marks on the head and the sides are bluish hazel instead of brown. The 'hog' tapirs of Central America (*Tapirus Bairdi* and *Tapirus Dowi*) are smaller than the other species, and differ from them in having the nasal septum ossified. They are brownish black above, dirty white on the throat and chest, and more or less rufous on the head.

The Malayan tapir (*Tapirus Indicus*) is found in the Malay Peninsula, Java, Sumatra, and other large islands. It is larger than the American tapir, and its proboscis is rather longer in proportion. The neck has no mane. The color is glossy black, except the back, rump, and sides of the belly, which are white. The colors do not pass gradually one into the other, but the line of separation is marked, giving the animal a very peculiar appearance. The habits of this species are not well known, but seem to be similar to those of the American tapir, and it is equally capable of domestication. The young are striped and spotted as in that species.

Fossil tapir-like forms are known from the Eocene onward, and most of them have been placed in the family Lophiodontidæ; but many species are hardly separable from the modern family Tapiridæ.

Consult: Beddard, *Mammalia* (London, 1902); Blanford, *Fauna of British India; Mammals* (ib., 1875); Alston, "Mammals," in *Biologia Centrali-Americana* (ib., 1879-82); Ridley, article in *Natural Science*, vol. vi. (ib., 1895); and general works. See Plate of TAPIRS AND HIPPOPOTAMUS.

TAP'LEY, MARK. The faithful servant of Martin Chuzzlewit, in Dickens's novel of that name. He accompanies his master to America, nurses him in his illness, and makes himself everywhere loved for his high spirits and joviality under the most adverse circumstances.

TAP'PAN, ARTHUR (1786-1865). An American merchant, philanthropist, and reformer, the brother of Benjamin and Lewis Tappan, born at Northampton, Mass. He entered business in Portland, Maine, removed to Montreal, Canada, and after the War of 1812 established himself in the importing business in New York City. In 1827 he associated with himself his brother Lewis in the publication of the *Journal of Commerce*. He was largely interested in various religious, educational, and philanthropic institutions. It is as an Abolitionist, however, that he will be longest remembered. He became interested in the American Colonization Society at its organization, but having become convinced that the society was being used by the pro-slavery party to rid the country of free negroes, in order to establish slavery more firmly, he withdrew from it. In 1830 he paid a fine which secured the liberation of William Lloyd Garrison from imprisonment in Baltimore, and the acquaintance which followed led to Tappan's identifying himself completely with the Abolition cause. In 1833 he was one of the organizers of the New York Anti-Slavery Society and of the American Anti-Slavery Society, of both of which organizations he became the first president. In 1840 he became president of the New American and Foreign Anti-Slavery Society, which was organized by those anti-slavery men who disagreed with the Garrison party, and believed in carrying the slavery question into politics and forming a political party for that purpose. He was therefore much interested in the Liberty, Free-Soil, and Republican parties. He spent the latter years of his life in retirement in New Haven. Consult Lewis Tappan, *The Life of Arthur Tappan* (1871).

TAPPAN, Lewis (1788-1873). An American merchant and reformer, brother of Arthur and Benjamin Tappan, born in Northampton, Mass. He became largely interested in cotton manufacturing and calico-print works in Boston, but in 1827 he removed to New York City. Thereafter his career was closely identified with that of his brother Arthur. In 1827 they established together the *Journal of Commerce*, of which Lewis Tappan became the sole proprietor in 1829. In 1833 he was one of the organizers of the New York (City) Anti-Slavery Society. In July, 1834, his house was sacked by an anti-slavery mob. The firm of Tappan & Co. failed for upward of a million dollars in the financial crisis of 1837, and although they afterwards paid their indebtedness, Lewis Tappan retired from the firm and in 1841 established 'Tappan's Mercantile Agency,' one of the earliest and best known organizations of this kind in the country. With his brother he was one of the organizers of the American and Foreign Anti-Slavery Society, and wrote and spoke in favor of a more rational and conservative attitude on the part of the reformers. He published a *Life of Arthur Tappan* (1871).

TAPPAN BAY, or Tappan Zee. An expansion of the Hudson River, in New York, lying immediately north of Irvington. It is about 11 miles long, and over 3 miles wide at the widest point.

TAP′PEN, Frederick D. (1829-1902). An American financier, born in New York City. He graduated at New York University in 1849, and in 1850 became a clerk of the National Bank of New York, of which in 1868 he was chosen president and director. During the great loans in 1873 and 1874 he was chairman of the loan committee. In 1896 he induced the New York banks to loan $20,000,000 in gold to the United States. In May, 1901, he formed a pool of $20,000,000 for loans and broke the 60 per cent. and 75 per cent. rate for call money. Again in the last week of June his efforts to preserve the credit of a tottering clearing-house bank succeeded in calming the market, although the bank, as he had predicted, failed.

TAPPERT, Wilhelm (1830—). A German writer on music, born at Ober-Thomaswaldau, near Bunzlau, Silesia. After teaching for several years, he studied music (1856-58) under Kullak and Dehn in Berlin, where he settled permanently in 1866, and became professor of the history of music at the new academy. His name is favorably known in the musical world through numerous contributions to periodicals and the following publications: *Musik und musikalische Erziehung* (1867); *Musikalische Studien* (1868); *Das Verbot der Quintenparallelen* (1869); *Wagner-Lexikon* (1877); *Richard Wagner, sein Leben und seine Werke* (1883); and *Wanderude Melodien* (1890).

TAP′PERTIT, Simon. A locksmith's apprentice in Dickens's *Barnaby Rudge*. He is in the employ of old Varden and is very much in love with Dolly, his master's coquettish daughter, whom, owing to his position as captain in the Gordon Riots, he is able temporarily to kidnap.

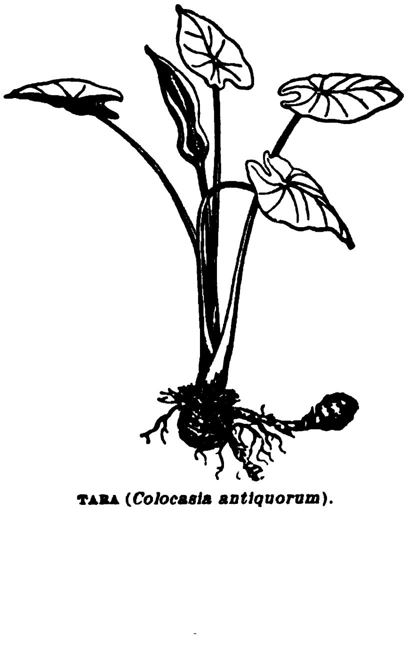
TAPTI, tăp′tē. A river of the Bombay Province, British India (Map: India, B 4). It rises in the mountains of the western part of the Central Provinces, and flows westward, emptying into the Gulf of Cambay, 160 miles north of Bombay, after a course of about 450 miles. The greater part of its course is followed by a railroad, but the river is unnavigable above Surat, a few miles from its mouth.

TAPUYA, tȧ-po͞o′yȧ (alien). A collective designation for a group of tribes holding an extensive area in Eastern Brazil, constituting a distinct stock, and apparently more ancient in occupancy than any of the surrounding tribes. Their general territory extends from latitude 5° to 20° S., and from the Atlantic coast inland to the Xingu River. They are sometimes also known as *Cren* or *Gueren*, the 'Ancient People.' The Tucano (q.v.) and several other tribes upon the Uaupes and Yapurá, on the Brazil-Colombia border are also thought to be of the same connection. The Tapuya tribes, among which the Botocudo (q.v.) are the most noted and typical, have every characteristic of an ancient primitive race. They are believed to have been the authors of the numerous shell mounds along the adjacent Atlantic coast, and it is even held that skulls and other human bones found in caves within their territory, in connection with bones of animals now extinct, are of the peculiar type belonging to this people. In physique the Tapuya are of middle stature, with long arms and short legs, broad faces, small deep-set eyes, retreating foreheads, and projecting lower jaws. Their features are frequently disfigured by huge labrets in the lower lip. Their culture is of the lowest. In their native forests they go absolutely naked and have no other dwellings than temporary shelters of brushwood. They make no pottery, build no canoes, have no dogs, and apparently have no tribal organization. Before interfered with by the Brazilian Government, they were cannibals. On the other hand, they are skillful hunters with the bow and arrow, make polished stone axes, and weave baskets of rushes. The men have but one wife at a time. They are much in fear of ghosts wandering in the night, and are fond of dances to the accompaniment of a flute which is played with the nose. Their language, of which specimens have been published by Ehrenreich, is difficult in its phonetics, with a marked tendency to simple word forms rather than agglutination. The Indians of Tupi descent about Pará and on the Lower Amazon are incorrectly called Tapuya.

TAR (AS. *tearo, tearu, teru, tyrwa*, Icel. *tjara*, Dutch *teer*, Ger. *Teer*, Hessian Ger. *Zehr*, tar; connected with Lett. *darwa*, tar, Lith. *darwà*, resinous wood, especially that of the fir-tree, and ultimately with Eng. *tree*). A term applied to the oily, dark-colored products obtained in the destructive distillation of peat, wood, coal, bones, and other materials of organic origin. Bone-tar is described under Dippel's Animal Oil (q.v.). Coal-tar is likewise described in a special article. (See Coal-Tar.) Wood-tar is commonly made from the resinous roots and wood of various pines. The wood is heaped into a conical stack depressed at the centre, covered with earth, and fired. The tar runs to the centre. This distillation may be more economically conducted in retorts. Wood-tar is largely used for water-proofing, preservative, and antiseptic purposes. In doses of one or two grains it is considered a good remedy in diseases of the mucous membrane of the respiratory passages. See Acetic Acid; Acetone; Methyl Alcohol, etc.

TARA, tä'rȧ. A hill in County Meath, Ireland, about six miles east of Trim and nearly the same distance southeast of Navan. It is noted as the site of the palace of the ancient kings of Ireland from the prehistoric Firbolgs (q.v.) down to the middle of the sixth century. It was here that Saint Patrick began his great apostolate by preaching to King Laoghaire or Leary in 432. The site was finally abandoned in 565 on account of a curse pronounced against the reigning King by Saint Ruadhan. The lines of the ancient palace may still be traced in the mounds and earthworks which crown the summit of the hill. Although the 'harp of Tara' has been thus silent through so many centuries, the place remains a focus and rallying point for Irish national aspiration. Here O'Connell, the liberator, held the greatest of his monster meetings during the Repeal agitation, and here also some forty years later Parnell erected the monument, which now stands out prominently above the landscape, to the memory of the Croppy insurgents who fell in an engagement near by during the rebellion of 1798.

TARA (Polynesian name), or **TARO** (*Colocasia antiquorum*, var. *esculenta*). A plant of the natural order Araceæ, cultivated for its roots, which are a leading article of food in the South Sea Islands. The roots, which are from 12 to 16 inches in length, are washed to remove their acidity, and cooked like breadfruit, the rind being first scraped off. See Cocco.



Tara (*Colocasia antiquorum*).

TARABULUS, tȧ-rä'bōō-lōōs. A town of Syria. See Tripoli.

TARAFA, tä-rä'fȧ (Ar. *Ṭarafa 'Amr ibn al-Abd al-Bakrī*) (c.560). An early Arabian poet. He lived at the Court of the King of Hira in Northeastern Arabia. In consequence of his satires on royalty, the King had him put to death. He ranks as one of the six great pre-Islamic poets of Arabia, and is the author of one of the seven *Mu'allakāt*, or prize poems, of that period, which remain the classic models of Arabic poetry. The Arabic text is in Ahlwardt, *Divans of the Six Ancient Arabic Poets* (London, 1870); there are translations by Rückert, in *Sieben Bücher der morgenländischen Sagen und Geschichten* (Stuttgart, 1837), and by Vandenhoff, *Nonnulla Tarafæ carmina* (Berlin, 1895).

TARA FERN (*Pteris aquilina*, var. *esculenta*). A species of brake (q.v.), the rhizome of which was one of the principal articles of food in New Zealand before the settlement of the islands. The root is cut in pieces about 9 inches long, placed in stacks, and carefully protected from rain.

This fern is also distributed in Australia, Japan, and the Hawaiian Islands. In Japan the cut rhizomes are macerated to remove the starch.

TARAI, tȧ-rī', or **TERAI.** A low, moist, and unhealthful region stretching along the southern base of the Himalayas nearly throughout their length, from Assam in the east to the Punjab in the northwest. In spite of its unhealthful nature, it is densely populated by tribes who seem to be immune from malarial diseases.

TARANTELLA, tä'rȧn-těl'lȧ (It., tarantula). An Italian dance, written in $\frac{6}{8}$ time, contantly increasing in speed, and alternating between the major and minor modes. It is accompanied by castanets and a tambourine. During the Middle Ages the dancing of the tarantella was thought to be a cure for a form of insanity which was induced by the bite of the largest of European spiders, the *Lycosa tarantula*. From the fifteenth to the seventeenth century a peculiar nervous disease, called tarantism, existed in Italy, whose only effective cure was the music of the tarantella. Of the many songs used for this purpose but few exist. Specimens are given in Jones's *Maltese Melodies* (London, 1805); Smith's *Musica Antiqua* (London, 1812); and Mendel's *Lexicon* (Berlin, 1870-83). The tarantellas written by modern composers bear little resemblance to their prototypes in either form or rhythm. They are written in $\frac{3}{8}$ or $\frac{6}{8}$ time, and, owing to their great rapidity, have become favorites for brilliant solo pieces. See Dancing Mania.

TARANTISM. A dancing or leaping mania supposed to be due to the bite of a spider, the tarantula (q.v.), and especially prevalent at Taranto, in Apulia, Italy. The disease was essentially a form of contagious emotional or hysterical excitation. The gesticulations, contortions, and cries somewhat resembled those observed in Saint Vitus's dance and other epidemic nervous diseases of the Middle Ages. The victims were supposed to have a passion for bright colors, music, and the dance, and a class of tunes called *tarantella* were composed for the cure of the disease. To these the patient danced until he was exhausted, and although the sufferers were subjected to other and extraordinary methods of treatment such as burial up to the neck in earth, none was so successful as the tarantella (q.v.). Not only dancing but catalepsy was one of the symptoms, and the disease appears to have affected all classes, ages, and both sexes. The disease spread over Italy and Southern Europe, and affected large numbers of people.

TARANTO, tȧ-rän′tō (Lat. *Tarentum*, from Gk. Τάρας, *Taras*). A town of South Italy, in the Province of Lecce, at the northern end of the Gulf of Taranto. It is situated on a rocky islet, formerly an isthmus, between the Mare Piccolo (Little Sea), an extensive harbor on the east or landward side of the town, and the Mare Grande (Great Sea), or open gulf, on the west. The harbor is one of the finest in Italy, and can be entered safely by the largest vessels. The principal buildings are a cathedral, dedicated to Saint Cataldo; a fine episcopal palace; a castle and fortifications, erected by Charles V.; and two hospitals. The streets are as narrow and dark as those of an Oriental city. Taranto has manufactures of velvets, linens, and cottons, and carries on some commerce in wheat, oats, and olive oil. The Mare Piccolo is famous for its abundance of shell-fish, and a considerable portion of the population derives its subsistence from the oyster and mussel fisheries. Population, about 40,000.

Ancient Tarentum was one of the most splendid cities of Magna Græcia. It was founded, according to very doubtful tradition, about B.C. 707 by the Parthenians, a body of Laconian youth. It rapidly grew in wealth and power, extending its trade even to the Po, and supplying much of Southern Italy with pottery. It seems to have steadily reduced its Messapian neighbors till B.C. 473, when a bloody defeat was followed by the fall of the aristocratic government and the establishment of a pure democracy. About B.C. 400 Tarentum appears as the leading Greek city in Italy. When in B.C. 281 the Tarentines came into collision with Rome, they invited to Italy Pyrrhus (q.v.) of Epirus. After his departure, his general, Milo, surrendered the town to the Romans, B.C. 272, who treated it leniently. During the Second Punic War it was captured by Hannibal, with the exception of the Acropolis, and when in B.C. 209 it was retaken by the Romans, it was sacked and 30,000 of the inhabitants sold into slavery. It continued to be inhabited and later was the seat of a prosperous Roman colony. Under the Empire it was quite overshadowed by Brundusium, on the Adriatic, but rose again during the Gothic wars, which left it in the hands of the Byzantine Empire. It was captured in A.D. 661 by the Lombards, and later passed into the hands of the Saracens, who sacked it in 927, and of the Greeks, from the latter of whom it was wrested by Robert Guiscard, the Norman, in 1063. Later it shared the fortunes of the Kingdom of Naples. Few relics of the classic Tarentum are extant, the chief being bits of an amphitheatre and traces of a Doric temple, which from its form must be one of the early monuments of that style.

TARANTULA (from It. *tarantola, tarantella*, from *Taranto*, Lat. *Tarentum*, Gk. Τάρας, *Taras*, a city in Southern Italy, where the spider is common). A famous species (*Tarantula fasciventris*) of European wolf-spiders (Lycosidæ), the bite of which was supposed to be fatal or at least to be followed by very serious symptoms. As a matter of fact the bite of this spider is not dangerous. The name tarantula is generally applied in the United States and elsewhere to certain of the large bird-spiders, or so-called American tarantulas of the family Theraphosidæ. These are large, hairy spiders occurring in the Southwestern United States, Central America, and South America, which possess large, hard polished fangs which move vertically and are thus used to pin down their prey. They feed upon insects and all sorts of small animals. *Aname Hentzii* is a large species of this group which has the most northern distribution of any of the so-called American tarantulas. It has a bite which is quite painful but not dangerous, and never fatal, so far as accurate records go. These creatures are nocturnal, usually hiding during the day in long silken tubes in cracks in the ground or under thatched roofs or in similar places. Some of the Central American species are occasionally brought into the Northern States in bunches of bananas and on board vessels containing tropical fruit.

THE TRUE TARANTULA.

TARANTULA KILLER. A large and conspicuous wasp (*Pepsis formosa*) common in the Southwestern United States and in Central America, which preys especially on 'tarantulas' (q.v.). It is more than two inches long. The head, thorax, abdomen, and long, spiny legs are black, while the wings are bright reddish brown with black spots at the tips. It stings the spider, the result of the stinging being complete paralysis, deposits an egg upon it, then buries it in a hole five inches deep after the manner of other mud-wasps (q.v.).

TARAPACÁ, tä′rȧ-pȧ-kä′. A northern province of Chile, bounded by Tacna on the north, from which it is separated by the Camarones, Antofagasta on the south with the Loa River as the dividing line, Bolivia on the east, and the Pacific on the west (Map: Peru, D 8). Its area is 19,306 square miles. The coastland is occupied by a mountain range rising to 6000 feet, and the eastern part belongs to the region of the Bolivian Andes. The interior is an elevated arid plain known as Pampa de Tamarugal. The wealth of the province consists chiefly in the immense deposits of nitrate, which are worked on a very extensive scale. Agriculture is carried on to some extent along the rivers, and there are silver mines near the capital, Iquique (q.v.). There is a railway line connecting the capital with Pisagua, the chief seaport, and the interior. Population, in 1885, 45,086; in 1895, 89,751. Tarapacá was taken by Chile from Peru in 1880 and was formally ceded in 1884.

TARARE, tȧ'rȧr'. A manufacturing town in the Department of Rhône, France, at the foot of Mont Tarare, 20 miles northwest of Lyons (Map: France, L 6). In 1756 the manufacture of muslins, for which it has since become famous, was introduced from Switzerland. The chief products of its mills are muslins, tarletans, silks, silk plush, and velvets. Population, in 1901, 12,334.

TARASCO, tȧ-räs'kō. An ancient nation of Michoacan, Mexico, constituting a distinct linguistic stock. According to their traditions they migrated from the north about the same time as the Aztec tribes (see NAHUATLAN STOCK), and about the year 1200 established their kingdom in Michoacan, maintaining their independence against the Aztec, whom they excelled in many culture characteristics. Their principal buildings, especially in their capital city of Tzintzuntzan, were of cut stone laid in mortar. Many of the ruins are still unexplored. Their calendar was nearly the same as that of the Aztec, and they had also a pictograph system. Their principal god was Curicaberis, the sun. The dead were cremated and both their funerals and their religious ceremonials were accompanied by human sacrifices. They were famous for their beautiful and durable fabrics of woven feathers as well as of cotton, and were skillful in the working of gold and silver. They surpassed all other native tribes in their defensive armor, which consisted of helmet, cuirass, and limb protectors, all of wood covered with plates of copper or gold. In physique they were considered the tallest and handsomest people of Mexico. They still constitute the bulk of the population of central Michoacan, and number about 200,000, and although they have lost the art of feather weaving, they maintain their reputation for the weaving of beautiful rebosos and belts with figures of birds and animals, and for their lacquer work. The language is vocalic and euphonious. Despite the fact that they offered no resistance to the Spanish invasion of Mexico, their last King, Tangaxoan, was tortured to death by Nuño de Guzman. In 1810 they were the first to revolt against the Spaniards, and thus, under Hidalgo, began the Mexican War for Independence.

TARASCON, tȧ'rȧ'skôɴ'. A town in the Department of Bouches-du-Rhône, France, 13 miles southwest of Avignon, on the Rhone River (Map: France, L 8). It is connected with Beaucaire on the opposite bank by a suspension bridge. The twelfth-century Church of Saint Martha, a composite of the Romanesque and Gothic, occupies the site of an old Roman temple. It was rebuilt during the fourteenth and fifteenth centuries. It has a tenth-century crypt, and the tombs of Saint Martha and Louis II. of Provence. Other objects of interest include the old Gothic castle completed in the fifteenth century, and the town hall. The leading industries are silk-spinning and the manufacture of hats. Population, in 1901, 8885. Tarascon is the ancient *Tarasco*. (See TARASQUE.) Daudet received here the inspiration for his *Tartarin de Tarascon*.

TARASP, tȧ'räsp'. A village of Switzerland, in the Lower Engadine, Canton of Grisons, situated on the Inn, at an altitude of 3910 feet, 36 miles from Chur and 28 miles from Saint Moritz. It is a health resort, frequented for its mineral baths. Population, in 1900, 275.

TARASQUE, tȧ-rȧsk'. A monster prominent in the local folk-lore of Tarascon, France, said to have been subdued by Saint Martha in early Christian days. The myth was in existence at least as early as the twelfth century, when the cathedral was built in memory of the event. On the fête 'La Tarasque,' an effigy of the beast is carried in procession about the streets of Tarascon and also at Beaucaire.

TARAXACUM. See DANDELION.

TAR'BELL, EDMUND C. (1862—). An American painter, born in West Groton, Mass. He was a pupil of Boulanger and Lefebvre. Light and air are what he seems to seek in his out-of-doors work, and he achieves this, not only through truth of color, but by a certain freeness and fragility of touch which contribute much to the sense of mobility and life in his landscapes and figures. His color is pure, and at times full of strength.

TARBELL, IDA MINERVA (1857—). An American author, born in Erie County, Pa. She graduated at Allegheny College in Meadville, Pa., and from 1883 until 1891 was associate editor of *The Chautauquan*. From 1891 until 1894 she was in Paris, studying at the Sorbonne and at the Collège de France. On her return she became an associate editor of *McClure's Magazine*. Her publications include: *Short Life of Napoleon Bonaparte* (1895); *Life of Madame Roland* (1896); *Early Life of Abraham Lincoln* (in collaboration with J. McDavis, 1896); *Life of Abraham Lincoln* (1900); and *History of the Standard Oil Company* (1903).

TARBES, tärb. The capital of the Department of Hautes-Pyrénées, France, on the left bank of the Adour, 32 miles by rail northeast of Pau (Map: France, G 8). The cathedral, dating from the twelfth century with a fine octagonal lantern tower, and the prefecture, formerly the episcopal palace, are the most noteworthy buildings. The town has also a library (22,000 volumes). It is well known for a breed of light horses, and has manufactures of woolens, machinery, and cannon. The town became a bishopric in 420 and in mediæval times was the capital of the County of Bigorre. It was occupied for forty years by the English during the fourteenth century. Population, in 1901, 26,055.

TARDE, tärd, GABRIEL (1843-1904). A French sociologist and criminologist. Born at the little town of Sarlat (Dordogne), he passed nearly twenty years there as magistrate and *juge d'instruction*. In 1880 he began to contribute to the *Revue Philosophique*, and gradually won his way to reputation, which was assured after the publication of his *Lois de l'imitation* in 1890. He later became professor of modern philosophy at the Collège de France in Paris. In a large number of books and articles, Tarde elaborated a complete and original theory of society. It is essentially a psychological theory. In Tarde's view, to study society is to study how the minds of men act, and how they influence one another. The essence of society, he held, is that one man should be so affected by another that the two should be brought to greater similarity of thought or action. Social life is a round of invention and imitation; an 'invention' being a new thought or act of any kind whatever, and 'imitation' any thought or act of copying or making after a model. Imitation obeys certain laws which Tarde made it his business to investigate. Thus it is usually the inferior who copies the superior, the lower class the upper class; it is generally true that a new idea has prestige because of its novelty, though if it be taken up as a permanent institution it will also come to prestige through the tradition of age. Circles of imitation spread from different inventions as do the ripples around stones thrown on a pond; the circles interfere, oppose, or combine, in complicated ways which Tarde sought to analyze. The essentials of his theory were presented in the *Lois de l'imitation*, and were much elaborated five years later in his *Logique sociale*, in which extensive illustrations were given from the whole range of social development. Along with his sociological theory, Tarde gradually developed a philosophical system, best summarized in his *Lois sociales* (1898). His psychological point of view is carried over into his criminological work. *La criminalité comparée* (1886), his first book, emphasized the purely social influences upon crime, with much criticism of the anthropological school of Lombroso. *La philosophie pénale* (1890) is a more systematic presentation of his ideas. Tarde's other works include: *Etudes pénales et sociales* (1892); *Les transformations du droit* (1893); *Essais et mélanges sociologiques* (1895); *L'opposition universelle* (1897); *Etudes de psychologie sociale* (1898); *Les transformations du pouvoir* (1899); *L'opinion et la foule* (1901); *Psychologie économique* (1902); in English translation, *Social Laws* (New York, 1898).

TARDIEU, tȧr'dyẽ'. A French family of engravers. NICOLAS HENRI (1674-1749), born in Paris, was a pupil of Lepautre and the Audrans. He became Court engraver, and executed a portrait of the Duc d'Antin (after Rigaud, 1720); "Constantine Exhibiting the Cross" (1742); and "The Battle Between Constantine and Maxentius" (1745). His son and pupil, JACQUES NICOLAS (c.1716-c.1791), succeeded him as Court engraver, and was also appointed engraver to the electoral Court of Cologne.—JEAN CHARLES (called Cochin) (1765-1830), a son of the preceding, was an historical painter, pupil of Regnault, took the second Prix de Rome (1790), and was favored by Napoleon. For the latter he painted "The Queen of Prussia at Tilsit in 1807," and two other pictures (Versailles).—JEAN BAPTISTE PIERRE (1746-1816), a grand-nephew of Nicolas Henri, was the first to raise the art of geographical engraving to great perfection, and was ably followed in its practice by his brothers PIERRE ALEXANDER (1756-1844) and ANTOINE FRANÇOIS (1757-1822), as well as the latter's son AMBROISE (1788-1841), who was equally successful with portraits and architectural subjects.

TARDIGRADA (Lat., slow-going). A group of little animals of uncertain affinities, represented by the bear-animalcules. They are minute, slowly moving, soft-skinned animals, not more than a millimeter in length, and are often referred to the class Arachnida, as distantly related to the mites. The body is short and thick, not divided into segments, the head slightly separated from the trunk. The mouth is provided with a sucking proboscis, and is surrounded by papillæ. The digestive canal opens by a muscular pharynx into a narrow œsophagus, which leads to a capacious stomach, succeeded by a short intestine. There are two eye-like spots, and the nervous system consists of a brain succeeded by a ventral nerve-cord of four ganglia. There are no heart, blood-vessels, nor any respiratory organs; and the animals are hermaphroditic. The segmentation of the egg (which is very large) is complete and regular. Tardigrades are not uncommon in bog-moss (Sphagnum), or in fresh and salt water, and are capable of revivifying after being apparently dead and dried up, if placed in water.

TARE (of uncertain etymology; possibly connected with ME. *tare*, brisk, eager). Various leguminous plants, especially species of Vicia, weak climbing plants, natives of the temperate parts of the Northern Hemisphere. One of these, the wild vetch (*Vicia hirsuta*), has very small flowers and pods, pinnate leaves, and small leaflets. It affords nourishing food for cattle, but the quantity is so small that it is seldom cultivated and is chiefly known as a weed. One species (*Vicia sativa*), with an upright branching habit, is cultivated in some parts of Europe for its herbage, which is thought to be rich enough to compensate for its small quantity. The plant thrives well in poor sandy soils, where it is valuable for green manure. (See VETCH.) The tare of the New Testament is supposed to be darnel.

VETCH.

TAREN'TOLA (It., Tarentine, from *Taranto*, from Lat. *Tarantum*, from Gk. Τάρας, *Taras*, a city of Southern Italy), or TARENTE. One of the commonest geckos (q.v.), or lizards, of the Mediterranean region (*Tarentola Mauritanica*), grayish brown with indefinite markings, and about six inches long. It has been introduced by ships into Southern France, and when it takes up its abode inside a house becomes almost domesticated. Some other geckos are also mistakenly called by this name. An interesting account of their habits may be found in Gadow, *Amphibia and Reptiles* (London, 1901).

TAREN'TUM. See TARANTO.

TARENTUM. A borough in Allegheny County, Pa., 21 miles northeast of Pittsburg; on the Allegheny River, and on the Pennsylvania Railroad (Map: Pennsylvania, B 3). It is primarily an industrial centre, being interested largely in the manufacture of plate glass and bottles. Other products include brick, lumber, steel and iron novelties, steel billets and sheets, sack and wrapping paper, etc. Coal is mined in the vicinity. The government, under the charter of 1842, is vested in a burgess, elected every three years, and a council. The electric light plant is owned and operated by the municipality. Population, in 1890, 4627; in 1900, 5472.

TARGET and **TARGET PRACTICE.** By target practice is meant the method by which proficiency is attained in marksmanship. In its military aspect, target practice is designed to give a thorough individual training to every soldier in the fighting use of his rifle. The preseribed course of instruction usually includes (a) preparatory instruction, embracing the construction, nomenclature, and mechanism of the rifle, the theory of fire, principles of aiming, pointing and aiming, judging or estimating distance, gallery practice, and blank cartridge firing; (b) range practice, in which the distances are known, and accuracy and steadiness of aim are developed; (c) demonstration firing; (d) collective or volley firing at long range; and (e) field or combat firing. Throughout Continental Europe generally, the school target consists of a wooden frame covered with jute cloth on which the paper targets are pasted. The centre band is white and the two outer vertical bands light blue or gray. The bull's-eye is in the centre of the target and usually there is also outlined an oval which represents the limit of dispersion of correctly aimed shots, aiming at 200 and 300 paces at the lower part, and at 400 paces at the upper part.

Figure targets are frequently colored to show details, otherwise they are plain light blue in color. Figure and section targets are used as fixed, moving, and disappearing targets. For firing at long ranges large groups of targets are used representing lines and columns in battle form; cavalry, guns, caissons, etc., arranged as in action being made to move or disappear so as to show different phases of a battle.

Typical of European practice are the permanent German Army ranges which have various figures arranged as disappearing or moving targets, manipulated from covers not noticeable from the front. A target representing a line of infantry a hundred meters (330 feet) long may be erected in ten minutes by eight men, while but one man is necessary to work it. The figures are so constructed as to be capable of standing erect or lying on the ground at the will of the operator. To represent the reënforcement or thinning of a line two or more of such lines of targets are placed close to each other, the figures in the rear showing through the intervals between those in front.

Since the Boer War considerable ingenuity has been exercised in devising a new system of instruction in musketry and field firing in the British Army. The war proved the musketry regulations of 1898 practically worthless, so that a new course was devised which was completed in 1903. The ground used at Aldershot enabled one battalion to advance to the attack with as near an approach to the conditions of actual warfare as is possible. The battalion performing the exercise advances in column of route when fire is suddenly opened upon it by a single gun posted about 800 yards to the left front. It is required that development be made at once and the gun silenced. As the firing line reaches the crest of a long hill perpendicular to the front, they are able to recognize the first position of their supposed enemy about 900 yards distant. The advance of the firing line is subjected to artillery fire from a battery about 2500 yards away. The targets representing the enemy are movable and can hardly be distinguished, as only the heads and shoulders are exposed, and that only occasionally. As the advance continues the enemy is supposed to have retired about 800 yards to a position which has a deep ravine in its front, through which runs a main railway line. The enemy's object is to destroy this line before the advance can occupy it, and with this object in view an armored train is dispatched to cover a party of men sent down to blow up the tracks, which they are supposed to succeed in doing. The advance continues beyond the railway and up the hill where the enemy is found to have taken his last position near the guns already mentioned. The battalion thus makes three positions, covering about 3500 yards. The targets are merely dummy figures of the crudest construction. They are all worked by men in pits by means of ropes and springs, with the exception of the armored train and the wrecking party. An elaborate system of telephones is installed, which connects all the pits and enables the commander of the range to be in constant connection at every stage of the firing. The ground is under close observation of the umpires, who are stationed in covered pits where they can see the advance by means of mirrors, in all its movements.

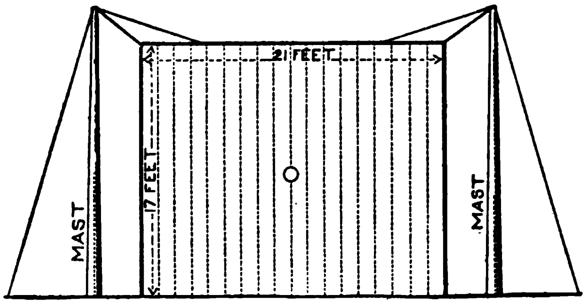
Greatly increased interest has been taken in the target practice of the various combatant branches of the United States Army. In 1877 the Creedmoor target with its method of scoring hits was introduced by General Ord, an innovation which was rendered doubly valuable by an increase of the ammunition allowance from 10 to 20 rounds a month for each soldier. In 1886 individual skirmish practice was introduced, the objective being in turn the figure of a standing man, a kneeling man, and a man lying down, followed by company instructions in field firing. Targets and materials differ according to the scheme of practice issued each year from the headquarters of the army. In the case of small arms practice the period selected for practice on a range is announced annually by department commanders and all orders containing instruction governing their preliminary methods or practice with a rifle, carbine, or revolver are issued each year from army headquarters. The education of the men in target practice is the direct responsibility of the company commander, although post commanders are required to exercise a close supervision also, and particularly over the skirmish and field practices. There is an inspector of rifle practice in each department selected for his special qualifications, whose duty it is to examine and report upon the target practice work of the troops in his department. The United States Government encourages the hunting for large game wherever practical. The small arms practice regulations for the National Guard of the State of New York are fairly representative of the best methods employed in the United States. The Creedmoor bull's-eye targets are employed for all classes except in skirmish fire, when the figures of men standing, kneeling, and lying down are used. To qualify as marksman, the soldier must obtain forty-five out of a possible seventy-five points, making fifteen out of a possible twenty-five at each of the following distances: 100 yards (standing); 200 yards (kneeling); 300 yards (prone). A sharpshooter is required in addition to make twenty-two points out of twenty-five at 500 yards and twenty out of twenty-five at 600 yards. The expert must make twenty out of twenty-five at 700 yards and at 800 yards must make a score sufficient to bring his total up to forty, for both ranges. A distinguished expert is required to make the same percentage and under the same conditions at 900 and 1000 yards. Skirmish firing is at different distances, and at figure targets. Shots on the prone figure count five each, and on the kneeling figure three each, while on any other place on the targets or on the standing target each shot counts one.

TARGET PRACTICE, Naval. On shipboard target practice is the culminating feature in the training of men who are to become gun-firers, or 'gun-pointers' as they are usually called. The men are first taught to aim accurately with small arms. The promising candidate is advanced to work with heavy guns—first simple aiming and then practice with aiming machines such as the Scott 'dotter.' This instrument has a target which can be given a vertical movement past the gun sights which simulates the movement of a ship or other object past these sights when the firing vessel rolls, and it has a pencil which records the point at which the sights are directed when the firing key is pressed. The next step is sub-calibre practice. A small-arm rifle is clamped to the gun or inserted in fixtures in the bore and fired at a target quite close at hand. Then larger sub-calibre guns or tubes are fitted in or on top of the large gun. In all sub-calibre work the regular sights of the large gun are used, an allowance being made for the difference in range (for a given elevation) of the two weapons.

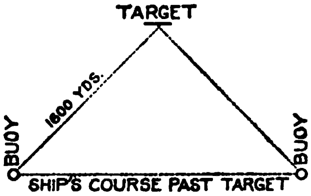
Nearly one-half the crew are expected to become sufficiently good shots to receive instruction and practice in all forms of sub-calibre work, but only the most proficient are given a chance with full-calibre ammunition. The number of shots fired by each man depends upon the class of gun for which he is being particularly trained; the larger guns are fired only a few times each year, the medium and lesser calibres many more times.

For full-calibre practice the target now used in most navies is 12 to 20 feet high, and 20 to 60 feet long. It is of canvas, supported by two or more small masts, which are set in the timbers of a raft or float, as shown in the accompanying figure.

The target is anchored in a manner to keep it broadside on and buoys are anchored at certain distances from it. The ship steams past from buoy to buoy at a fixed speed (usually more than 6 and less than 12 knots). Firing begins as the first buoy is passed and stops when the last buoy is reached. See Gunnery; also, Guns, Naval.



A NAVAL TARGET.



MOVEMENT OF SHIP IN TARGET PRACTICE

TARGOVITZA, tär′gô-vĭt′sȧ, Confederation of. A union of Polish nobles under the leadership of Felix Potocki, formed at Targovitza (Russian Government of Kiev) on May 14, 1792, for the purpose of overthrowing the Constitution adopted in the preceding year. The organizers of the Confederation were entirely in the interests of Russia, and the adhesion of the Polish King to the Confederation was followed by the second partition of Poland (q.v.).

TARGUM (Aram. *targûm*, translation, explanation, from *targĕm*, to interpret). The general term for the Aramaic versions of the Old Testament, sometimes less correctly referred to as the Chaldee Paraphrase. The origin of the Targum is to be looked for in the Persian period of the Jews, when Hebrew ceased to be the popular language and gave way to the Aramaic. The first indication of the practice of explanation is to be found in Neh. viii. 8, where it is said that Ezra read the Law to the people while his assistants "caused them to understand the reading." The custom grew and gradually there arose a class of Meturgemans (mod. dragoman, interpreter) and finally the system was regulated by the Rabbis. At first and indeed for many centuries the Targum from its very nature was not committed to writing, for the same reason that the oral law itself was never intended to become a definitely formulated written code. In the course of time, however, both yielded to circumstances and it was thought preferable to write them down rather than have them forgotten. Yet only a small portion of the immense mass of oral Targums that was produced survived. All that is now extant are three distinct Targums on the Pentateuch, one on the Prophets, and Targums on the Hagiographa, viz. on Psalms, Job, Proverbs, the five Megilloth (Song of Songs, Ruth, Lamentations, Esther, Ecclesiastes), on Chronicles, and on the apocryphal pieces of Esther.

The Targums are of little help for purposes of text criticism. Their main claim upon scholars rests upon the fact that in them there are to be found hints at the internal and external life of the people at the time when they were composed. The text is in a very corrupt condition, as might indeed be expected, since no proper care was taken to secure the purity of the text when the Aramaic began to decline as the spoken tongue of the Jews. A translation of the Targums on the Pentateuch into English was made by Etheridge (London, 1862-65). The *Editio Princeps* of Onkelos (q.v.) is that of Bologna (1482), of the Targum on the Former Prophets that of Leira (1494), and on the Latter Prophets that of Venice (1517-18). Targums on the Hagiographa appeared in the Rabbinic Bibles, but the Targum on Chronicles was not published until 1680. Recent editions of the Targum are: Pentateuch (Targum Onkelos) by A. Berliner (Berlin, 1884); Prophets (Prophetæ Chaldaice) by Lagarde (Leipzig, 1872); Hagiographa (Chaldaice) by the same (Leipzig, 1873).

TARIFA, tá-rē′fá. A seaport town of Spain, in the Province of Cadiz, on the coast, 21 miles west-southwest of Gibraltar (Map: Spain, C 4). It is the most southern town of Europe, is surrounded by tower-embattled walls, and communicates by a causeway with a small island, on which stand a fortress and lighthouse. The town is the most thoroughly Moorish in Andalusia; it is quadrangular in shape, and its streets are narrow and dark. Tunny and anchovy fisheries are actively carried on. Tarifa, the Carthaginian *Josa*, and the Roman *Julia Traducta*, received its present name from the Arabs, who are said to have called it after Tarif ibn Malik, who landed there to reconnoitre previous to the conquest of the country. It was successfully defended in 1812 by 2500 troops (mostly British) against a French force of 10,000 men, under Victor and Laval. Its population in 1900 was 11,730.

TARIFF (OF., Fr. *tariffe*, Fr. *tarif*, from Sp. *tarifa*, price-list, rate-book, from Ar. *ta'rīfa*, *ta'rīf*, notification, inventory, from *'arafa*, to know). A schedule of duties or imposts levied upon goods as they pass from one State to another. A tariff may be levied upon foreign goods: (1) simply as a means of augmenting the revenues of a government, in which case it is a form of taxation (see TAX; FREE TRADE); or (2) as a means of retaliating upon foreign governments for similar restrictions imposed by them, in which case it becomes an instrument of warfare serving a temporary purpose and designed in the end to secure commercial reciprocity; or (3) as a means of fostering artificially particular industries by protecting them wholly or in part against foreign competition. See PROTECTION.

GENERAL HISTORY OF TARIFF LEGISLATION. Tariffs for revenue seem to have been usual among the civilized nations of antiquity. Among the Greeks, especially the Athenians, a tariff was regularly resorted to as a means of revenue. This tariff was laid upon both exports and imports, and an additional tax was collected from vessels engaged in foreign traffic for the use of the harbors in which they anchored. The regular export and import duty at Athens was 2 per cent., though in time of war, when the State was in pressing need of large sums of money, it was often considerably augmented.

Import and export duties were regularly levied by the Roman State also for revenue. The name for this tax used by the Latin writers is *portorium*, a name applied likewise to transit duties and bridge tolls. In the provinces and in newly conquered countries, duties were collected by Roman officials known as *portitores* and *publicani*, and the sums were transmitted to the Roman treasury. In some cases, however, the central Government, as a particular favor, allowed the subject State to make its own customs laws, stipulating only that Roman citizens should be exempted from paying any duties that might be imposed. In B.C. 60 all *portoria* were abolished by the Lex Cæcilia so far as concerned the ports of Italy; but Julius Cæsar soon after restored them. Augustus Cæsar still further increased the number of dutiable commodities, and a long list of those which under the later emperors were subject to the payment of a duty is given in the Digest of Justinian. The rate of duty at Rome seems generally to have been 5 per cent., but under the later emperors a duty of 12½ per cent. (*octava*) is mentioned as the ordinary tax on imports.

In the Middle Ages the feudal lords individually claimed and exercised the right of imposing transit duties levied on all goods that passed by or through their possessions. Hence, says a recent writer, "the rivers and high-roads were fairly lined with custom-houses and toll-gates." When feudalism gave way to monarchy and strong central government, the kings transferred to themselves the rights that had previously been exercised by the barons. They, too, erected custom-houses at all their frontiers, and even on the boundaries of their different provinces. So universal did these duties, local and national, become, that every Continental nation was covered with a network of customs lines. Various cities also had their local customs duties, of which the *octroi* collected at the entrance to several cities on the Continent, notably Paris, is a survival.

In England we first hear of a tariff for revenue under King Ethelred in or about the year 980. At that time duties on ships and goods were levied and ordered to be paid at Billingsgate, London. They were first acknowledged as a part of the King's revenue in the reign of Edward I., who received them by regular grant from Parliament, if we may accept the assertion of Sir Edward Coke, quoted by Blackstone. But wool, skins, and leather were taxable at the royal pleasure, these being the 'hereditary customs' of the Crown, known in the law-Latin as *custuma antiqua*. Subsequently, under the same King, special duties to be paid by foreign merchants only were levied (*custuma nova*), which were protective in their nature and not merely for revenue. The duty on ordinary goods in this reign was sixpence in the pound, which was raised to one shilling (5 per cent.) under Richard II., reduced to sixpence and again raised to eightpence, and finally fixed at the shilling rate, where it remained as late as the ninth year of the reign of William III. (1697). The King also had the right of *prisage*, i.e. of taking from every wine-importing vessel of twenty tuns two tuns for the royal use. This duty was called 'tunnage' to distinguish it from the other duties called 'foundage.' Customs duties were originally granted 'for the defense of the realm,' and especially for the protection of traffic on the high seas, and were at first given for a fixed period. To Henry VI., Edward IV., and their successors, they were given for life, until the reign of Charles I. whose unconstitutional levy of these duties without grant of Parliament formed one of the grievances against him. On the restoration of Charles II. the duties were again granted for life, and under William and Mary they were made perpetual and assigned to the payment of the national debt.

From an early period it was the custom in England to base tariff duties upon official valuations of imports and exports. A 'book of rates' containing such valuations is known to have been printed in 1545. The struggle between the first Stuarts and Parliament over questions of taxation was precipitated by the arbitrary action of James I. in raising the official rates without the consent of Parliament. In 1642 the latter body itself issued a book of rates without the assent of the sovereign. After the Restoration a new book of rates was issued in 1668 with the assent of both authorities. This enumerated as many as 212 articles for taxation 'outward' (i.e. export duties) and 1139 articles for import duties. Official valuations continued to be the basis for tariff purposes all through the eighteenth century, and this is one circumstance which makes it difficult to estimate correctly the value of England's exports and imports during that period. Another confusing practice which prevailed until as late a date as 1787 was that of assigning the proceeds from the duties on imports and exports to a variety of different purposes or 'funds.' As a consequence it was often very difficult even for customs officials to determine what was the aggregate rate to which a particular article was subject. Pitt's Customs Consolidation Act of 1787 did away with the separate funds by assigning all revenue from duties to the 'consolidated fund.' In this act some 1200 articles were rated for import duties and 50 for export duties. Another important achievement of Pitt's Ministry was the negotiation of a commercial treaty with France (1786) which went far toward freeing trade between the two countries from the restrictions by which it had long been hampered. The struggle against Napoleon caused the abrogation of this treaty, but it is no exaggeration to describe it as the first definite step in the direction of that free trade policy which England was to adopt some sixty years later. The next simplifications of the English tariff were those effected by Huskisson in 1824 and 1825, which consolidated some 450 trade and tariff acts into eleven and reduced the rates of duty on many articles, particularly exports. One of the most important results of the long struggle for the abolition of the Corn Laws (q.v.) was to simplify still further the English tariff. From 1842 to 1846, 390 duties, including all those on exports, were abolished and 503 were reduced; in 1846, 54 were abolished and 112 were reduced; in 1853, 123 were abolished, and finally, in 1860, 371 more were abolished and virtual free trade was achieved. An important incident of the latter year was the negotiation with France of a new commercial treaty which lowered the duty on wine and placed such important French products as silks, gloves, etc., on the free list. For both countries the treaty marked a long step in the direction of free trade, but in the case of France the policy appears to have lacked the support of public opinion and was followed after the Franco-Prussian War by a reaction toward protection. The reduction and abolition of duties continued in England after 1860, the next important change being the placing of sugar on the free list at a sacrifice of some £6,000,000 revenue in 1872. On the outbreak of the Boer War the English tariff included only nine principal items, cocoa, coffee, chicory, dried fruit, tea, tobacco, wine, beer, and spirits. The extraordinary revenue required in connection with that struggle led to the restoration of the duty on sugar, to the imposition of an export duty on coal, and finally to the restoration of light registration duties on grain and flour (3d. and 5d. per cwt. respectively).

In the tariff history of France the two commercial treaties with Great Britain that have been referred to stand out as prominent features. Down to the time of the first (1786) the tariff policy of the country had been dictated by extreme mercantilist views of trade. The importation of many commodities was prohibited altogether, while others were admitted only on payment of high duties. Nor was the tariff confined to foreign trade. Each petty province of France had its system of duties, with the result that it was not unusual for the prices of even such common articles as the grains and salt to differ by 100 per cent. or more on the same day in different parts of the country. It required nothing less than the Revolution (decree of 1790) to free the land from these restrictions on internal trade. The bitter national hostilities which grew out of the Revolution and the brilliant years of Napoleon's ascendency effectually stifled the aspirations for freer trade which ushered in the period. From 1815 until the negotiation of the second commercial treaty with Great Britain in 1860, the tariff policy of France was highly protectionist. The latter treaty was one of the fruits of the Anglomania of Napoleon III. and was followed by treaties drafted on equally liberal lines with the more important Continental States of Europe, including the German *Zollverein* (1865). These reduced the rates of duty on French imports to from 10 to 15 per cent. *ad valorem*. The same liberal policy was continued substantially until 1881, when an act was passed substituting specific for *ad valorem* duties and incidentally increasing somewhat the rates. Protectionist sentiment increased after 1881 and by 1892, when many of the commercial treaties negotiated at an earlier period expired, the country was ready for an out-and-out protectionist tariff, including not only high duties on agricultural products and manufactures, but also moderate bounties to producers of silk, flax, and hemp. At this time also the policy of providing maximum and minimum duties (see RECIPROCITY) was introduced. Since 1892 there has been no perceptible abatement in the demand for protection in France, and while French duties are moderate in comparison with those of the United States, she must be included among protectionist countries.

The tariff policy of the States now forming the German Empire first assumed definite form in the German *Zollverein* (q.v.). The importance of this early federation for tariff purposes in preparing the way for the German Empire is generally conceded. From the point of view of tariff history it is interesting because it enabled Prussia, which was inclined toward free trade during this period, to dominate the tariff policies of her smaller neighbors. A treaty negotiated with Austria in 1853 reduced the duties on trade between that country and the *Zollverein* and the even more liberal treaty with France, already referred to, secured the same result for trade with that country in 1865. On the eve of the Franco-Prussian War the tariff of the *Zollverein* was practically a tariff for revenue only. After the war a reaction toward protection set in. This is clearly indicated in the tariff adopted in 1879, by which the duties on both agricultural and manufactured articles were increased. The policy continued to be only moderately protective until 1902, when an act was passed which made very substantial concessions to the advocates of protection to agricultural interests. Among the most notable changes were an increase in the duties on grains (the duty on wheat was raised from 32 cents per cwt. to 90 cents) and on draught animals (the duty on horses valued at $250 or less was raised from $2.50 to $22.50).

The changes in the tariff policies of France and Germany that have been described have been paralleled pretty closely in the other countries of Continental Europe. England's example and other influences caused a movement in favor of free trade to extend all over Europe in the decade from 1860 to 1870. This was followed by a reaction toward protection in the more important countries, which has gained in volume until in Germany and Russia, at least, the movement is comparable with the protectionist movement in the United States.

Outside of Europe England's free trade example has been followed only by two or three of her own dependencies (e.g. India). Protective tariffs are found in Canada, in the Australian colonies, and in Cape Colony, and are well-nigh universal among the independent sovereignties. No country has, however, gone further in this direction than the United States.

HISTORY OF TARIFF LEGISLATION IN THE UNITED STATES. The earliest tariff in the history of the United States was that approved July 4, 1789. It is interesting to note that the preamble of the act establishing it states that one of its objects is "the encouragement and protection of manufactures," at this early period laying down a principle afterwards adopted as the tenet of a political party. In 1817, at the beginning of President Monroe's administration, Congress abolished the internal taxes that had been made necessary by the cost of the War of 1812, and in his message the President recommended the imposition of a protective tariff pure and simple. A temporary protective duty had in 1816 been laid upon cottons and woolens, and in 1818 this was continued for a period of eight years. The rise of the party of Loose Construction, headed by Henry Clay, was favorable to the principle of protection, as the Strict Constructionists held that Congress could impose a tariff only for revenue. In 1819 a protective tariff bill passed the Lower House, but was rejected by the Senate. The election as Speaker, in 1820, of John W. Taylor, of New York, a declared high-tariff man, gave great encouragement to the Eastern manufacturers, and indicates the increasing influence of the protectionists, although in 1822 the Strict Constructionists were able again to defeat bills embodying the protective principle. In 1824, however, the friends of that principle secured a working majority in Congress, and after a prolonged debate adopted a bill whose essential principle was the exclusion from the American market of such foreign goods as competed with those manufactured in the United States.

In 1827 a convention held at Harrisburg, Pa. (July 30th), discussed at length the principle of protection. Only four of the slave States sent delegates. The result of the convention was a petition to Congress praying for an increase of duties on certain articles then manufactured in the United States, a request which the Secretary of the Treasury made prominent in his report of the following December. By this time a strong party had been founded to support the protective system, or the 'American system,' as it was popularly called. The famous 'Tariff of 1828,' adopted by Congress after a debate of six weeks, was the immediate result of this party's propaganda. This went further than any act had previously done in the direction of prohibitive duties. The chief articles on which protective duties were laid were woolen and cotton fabrics. At that time the value of the cotton goods annually imported from Great Britain was fully $8,000,000, and that of woolen goods about the same. The exports to Great Britain, on the other hand, of rice, raw cotton, and tobacco (the chief products of the South), reached the sum of $24,000,000 per annum. The Southern producers naturally feared that if the United States should by a high tariff practically prohibit the importation of a large proportion of British goods, retaliatory measures might lead to a diminution of the Southern exports to Great Britain. It was dissatisfaction with the tariff that led to the famous nullification movement in the South in 1832, in which year Congress, while modifying the act of 1828, distinctly recognized and retained the protective principle.

On March 3, 1833, the so-called Compromise Tariff, introduced by Henry Clay, was passed. It provided for the gradual reduction of the existing tariff until 1842, after which year the duties on all goods were to be 20 per cent. This measure for the time allayed the excitement in the South; but by the year 1842 it was seen that the financial consequences of the steady reduction of the tariff were extremely serious, since the Government revenues had decreased to such an extent as to be less than the expenses. A new tariff was manifestly necessary. The majority in Congress passed a bill which continued the duties imposed by the tariff of 1833, and provided for the division of any surplus revenue among the States. This was vetoed by President Tyler as being a violation of the compromise reached in 1833. A revenue tariff was also vetoed, because it contained the distribution clause, but on its being again passed, with this clause omitted, the President signed it (August 9, 1842). In 1846 a revenue tariff that eliminated altogether the principle of protection was passed, its aim being merely to provide an adequate revenue for the expenses of the Government. A still further reduction of duties was made by the tariff of 1857, which fixed them at the lowest figures shown by any tariff since that of 1816.

In 1861 the Republican Party passed the 'Morrill Tariff,' intended primarily to protect American manufactures. Twice in the same year (August 5th and December 24th) the duties were still further increased, less for protection, however, than in order to meet the expenses entailed by the Civil War.

The problems that were injected into politics by the war, and by the conditions resulting from it, relegated the tariff question to the background for many years. During this period duties were raised with little opposition to an unprecedented level. After the close of the war other questions still absorbed public attention, and it was not until 1880 that the tariff again became an important issue. The Republicans in nominating General Garfield embodied in their platform a strong declaration in favor of maintaining a scale of duties that should continue to protect American industries against foreign competition. The Democrats began to urge the expediency of modifying a tariff which had been framed to meet the conditions of a time of war, and which, they claimed, was not merely hampering commerce, excluding the United States from the markets of the world, but fostering monopolies by preventing healthful competition. They therefore declared for 'a tariff for revenue only,' which was afterwards explained as a tariff that should give 'incidental protection.' In 1882 provision was made by Congress for the appointment of a commission to report upon the expediency of a reduction of the tariff. This reduction became a question of pressing importance, since the revenues of the Government had so far exceeded its expenses as to accumulate in the treasury a very large and increasing surplus, which threatened to disturb seriously the financial system of the country. The Tariff Commission made its report, and in accordance with its recommendations the act of 1882, a distinctly protectionist measure, was passed. In 1884, the House being Democratic, the bill known as the 'Morrison Horizontal Reduction Bill' for lowering the tariff was hotly debated, but by a combination between the Republicans and the Democratic protectionists led by Mr. Randall, of Pennsylvania, it was defeated. The campaign of that year turned to some extent upon the tariff question, for the Democratic platform, while evading the question of protection, demanded a real reduction of tariff duties, as well as legislation to check the aggression of great corporations. The election of Mr. Cleveland appeared to show that the cry of 'free trade' had ceased to alarm the great body of voters, and that they were willing to hear argument upon the questions at issue. The new President's first message (December 16, 1885) recommended a reduction of the tariff, and his message in December, 1887, was devoted exclusively to this topic. In it he stated that the surplus in the treasury was nearly $140,000,000, demanded as a remedy the immediate abolition of the duties upon wool and other raw materials, and characterized the existing tariff laws as "vicious, inequitable, and illogical." In accordance with the views of this message a new tariff measure, the 'Mills Bill,' removing the duty on wool, and aiming at an estimated annual reduction of revenue of fully $50,000,000, passed the House. The Republican Senate offered a substitute repealing the tax upon tobacco and reducing the duty on sugar one-half, thus securing an estimated reduction of $65,000,000 per annum. Neither bill became a law.

The defeat of the Democrats in the Presidential election of 1888 was possibly due to the prominence of the tariff question, but as the majority of the popular vote was on their side, it was seen that a reform or, at any rate, a revision of the tariff was sooner or later inevitable. Therefore, the Fifty-second Congress took up the matter in earnest, with the result that the famous McKinley Bill passed both Houses of Congress and was signed by President Harrison (September, 1890). By its provisions the annual reduction of revenue was estimated to be some $66,000,000, of which $6,000,000 was due to a reduction of internal revenue taxes, chiefly on tobacco. A bounty was provided to compensate producers of raw sugar for the abolition of the duty on that commodity.

One very important feature of the McKinley Act was the section added through the influence of James G. Blaine, then Secretary of State, and known as the reciprocity section. This provided that whenever the President shall be satisfied that the Government of any country producing and exporting sugars, molasses, coffee, tea, and hides, or any such articles, imposes duties upon products of the United States which in view of the free introduction of such sugar, molasses, etc., into the United States, he may deem to be reciprocally unequal and unreasonable, he shall have the power to suspend by proclamation the free introduction into the United States of such sugars, etc., from the country in question. See CUSTOMS DUTIES; RECIPROCITY.

On the return of the Democratic Party to power in 1893, an effort was made to carry out its promise of tariff reform. A bill framed by William L. Wilson passed the House, and after much amendment by the Senate became a law without the President's signature, August 27, 1894. It made a considerable reduction in many duties, admitted wool free, and provided for an income tax. It was still in the main, however, a protective measure. As a revenue law this act was a failure, partly because the

Supreme Court declared the income tax feature unconstitutional and partly because of the business depression which began in the summer of 1893 and caused a marked falling off in imports. The dominant issue in the next Presidential campaign (1896) was the silver rather than the tariff question, but the election of the author of the McKinley Act was naturally construed as a popular verdict in favor of the policy with which his name was identified. A special session of Congress was called in March, 1897, and after prolonged debate the Dingley Act, copied closely in its leading provisions after the McKinley Act, became a law. The duties on wool, woolen goods, cutlery, pottery, and a few other articles were made even higher in this act than they had been in the act of 1890. Lumber was restored to the dutiable list, and hides, which had heretofore been admitted free, were taxed, out of deference to the wishes of the so-called 'Silver Republicans' in the Senate, who made this concession a condition to their adhesion. The sugar bounty provision of the McKinley Act was not revived, but the reciprocity provisions were, in modified form.

In 1898 (June 13th) the so-called 'War Revenue Law' was passed to supply the revenue required in consequence of the war with Spain. An interesting feature of this law was that it relied upon increased internal revenue duties and a purely revenue duty of ten cents a pound on imported tea rather than on changes in the general tariff to secure the additional revenue required. The war taxes were repealed by the acts of March 2, 1901, and April 12, 1902 (except those on 'mixed flour'). During the session of 1902 to 1903 earnest efforts were made in Congress by members of the Republican Party representing some of the States of the Middle West (e.g. Wisconsin) to effect a revision of those clauses of the Dingley Act supposed to be favorable to the 'trusts,' but without success.

ADMINISTRATIVE ASPECTS OF THE TARIFF. There is a marked difference in form between purely revenue tariffs, such as that of Great Britain, and protective tariffs like those of the United States and Germany. In the former only the few articles subject to duty are enumerated and unenumerated articles are admitted free. In the latter all articles that may claim free admission are expressly enumerated in the so-call 'free list,' and other articles are subject to duty either under the special schedules or under the so-called 'drag-net clause,' which imposes a certain rate of duty on unenumerated articles. The German tariff of 1902 enumerated nearly one thousand different classes of commodities, while in the American tariff of 1897 the free list alone contains nearly two hundred and fifty separate items.

Another difference that has frequently characterized protective and revenue tariffs in the United States is that the duties in the former are mainly specific, that is based on the quantities or the number of units of the commodities imported, while in the latter they are mainly *ad valorem*, that is a certain per cent. of the value of the commodities imported. The preference of protectionists for specific duties is to be explained partly by the greater certainty of such duties, since they cannot be evaded by undervaluations, and partly by their conviction that since protection rather than revenue is the object sought, the ordinary canons of taxation, which prescribe that taxes shall be in proportion to the value of the property taxed, may be disregarded. The identification of specific duties with protection appears to be confined to the United States, since even in free-trade England all the duties now imposed are specific. The administrative advantage of such duties, which are practically self-assessing, need scarcely be dwelt upon.

BIBLIOGRAPHY. McCulloch, *On Taxation* (London, 1845); Sumner, *Lectures on the History of Protection in the United States* (New York, 1877); Ayers, *Review of the Tariff Legislation of the United States* (Newark, 1883); Mason, *A Short Tariff History of the United States* (Chicago, 1884); Hall, *A History of Customs Revenue in England from the Earliest Times to the Year 1827* (London, 1885); Wagner, *Finanzwissenschaft*, especially the section on "Das Zollwesen Frankreichs und Englands" (Leipzig, 1883-1901); Bolles, *The Financial History of the United States* (New York, 1886); Dowell, *History of Taxation and Taxes in England* (London, 1888); Say, *Dictionnaire des finances*, articles "Entrepôt," "Douane" (Paris, 1889); Goss, *The History of Tariff Administration in the United States* (New York, 1891); Taussig, *Tariff History of the United States* (New York, 1892); Leroy-Beaulieu, *Traité de la science des finances* (6th ed., Paris, 1899); Palgrave, *Dictionary of Political Economy* (London, 1899), articles "Import Duties," "Export Duties;" Conrad, *Handwörterbuch der Staatswissenschaften* (Jena, 1900), articles "Zölle," "Zollverein;" Dewey, *Financial History of the United States* (New York, 1903). See FREE TRADE; PROTECTION; RECIPROCITY; TAX AND TAXATION.

TARIJA, tȧ-rē′hȧ. A southern department of Bolivia, bounded by Argentina and Paraguay on the south, and Brazil on the east (Map: Bolivia, E 8). Its boundaries are ill defined. Area is estimated at 53,000 square miles. The surface in the western part (one-third of the area) is very mountainous, and in the east is flat, resembling the Chaco of Paraguay, of which it is a continuation. There are extensive forests and large stretches of grazing land. The chief river is the Pilcomayo. Agriculture and stock-raising are the main industries, but both are only slightly developed, on account of the sparse population. The civilized population, largely in the mountain region, was officially estimated, in 1898, at 65,000, including over 46,000 Indians. Capital, Tarija (q.v.).

TARIJA. The capital town of the Department of Tarija, Bolivia, on the upper course of the Vermejo, 180 miles south of Sucre, near the border of Argentina, with which it has extensive trade (Map: Bolivia, E 8). The climate is pleasant. Population, about 9000.

TARIK, tä′rĕk, IBN ZIAD (?-c.720). The leader of the first Moslem invasion of Spain. He was a Berber, and had been converted to Mohammedanism by the Emir Musa, who made him governor of Tangier. It was probably on April 30, 711, that Tarik landed at Gibraltar (i.e. *Djebel-Tarik*, the hill of Tarik) with a force of twelve thousand men. He speedily overran Andalusia, and in July, 711, the Visigothic King Roderick was totally defeated at

Jerez de la Frontera. Musa, however, became jealous of his successful lieutenant, and joined him in the summer of 712 at Toledo with about twenty thousand men. There were frequent quarrels between Musa and Tarik, until finally both were summoned to Damascus by the Caliph Solyman. Musa was disgraced, while of Tarik nothing further is known. Consult Burke, *History of Spain*, vol. i. (London, 1895).

TARIM, tȧ-rēm′. The principal river of Chinese or East Turkestan (Map: Asia, H 4). It rises in the Karakorum Range in the extreme northern part of Kashmir, and flows north, east, and southeast through the great desert basin of Turkestan, emptying into the collection of lakes and marshes known as Lob Nor (q.v.) at the northern base of the Altyn-Tagh. Its length is estimated at over 1000 miles, including the upper course, which is generally called the Yarkand-Darya. After leaving the lofty glaciers of the Karakorum it pierces the Kuen-lun Mountains, and then descends to the plain, where it passes the city of Yarkand. Farther north it receives two large tributaries, the Aksu from the north and the Khotan-Darya from the south, below whose confluence the united stream is known as the Tarim proper. It soon divides into two arms, which flow parallel for a long distance. Receiving no more tributaries, it decreases rapidly in volume by evaporation and by being used for irrigation. A number of streams run down from the Kuen-lun toward the lower Tarim Valley, but they are lost in the great desert long before they reach the main stream. As the latter enters the Lob Nor region, however, it receives the Cherchen from the Tibetan Plateau and another large affluent from the north.

TAR′KINGTON, Newton Booth (1869—). An American novelist, born in Indiana, and educated at Princeton University, where he graduated in 1893. His first book, *The Gentleman from Indiana* (1899), attracted some attention, and his *Monsieur Beaucaire* (1900) is an artistically constructed romance of unusual charm. In 1902 he published *The Two Vanrevels*, less meritorious than his preceding works. He was elected to the Indiana Legislature in 1902.

TÁRLAC, tär′lȧk. A province of Luzon, Philippine Islands, bounded on the north by Pangasinán and Nueva Ecija, on the east by Nueva Ecija, on the south by Pampanga, and on the west by Zambales (Map: Philippine Islands, E 4). Area, 1295 square miles. The eastern part is level, while the western portion comprises the slope of the Cordillera de Cabusilán. The northern rivers drain into the Gulf of Lingayén, through the Agno, and the southern into Manila Bay, through the Pampanga. The main highway and the railroad traverse the province from north to south. Rice and sugarcane are the principal agricultural products, though some tobacco and corn are raised in the higher altitudes. The forests of the province are of great value; oranges, lemons, and bananas are produced in great variety. The languages are Tagálog, Pampango, and Pangasinán. The capital is Tárlac (q.v.). The population of the province, in 1901, was estimated at 89,339.

TÁRLAC. The capital town of the Province of Tárlac, Luzon, Philippines, on the right bank of the river of the same name, a tributary of the Agno, seventy-three miles northwest of Manila (Map: Luzon, E 4). It is on the Manila and Dagupán Railroad, and has excellent road connection with surrounding towns. Population, about 9,668.

TARLATAN (probably from Milanese It. *tarlantanna*, linsey-woolsey). A thin, gauze-like fabric of cotton. It is usually dyed or printed in colors, and is often of a rather coarse quality.

TARLETON, tärl′ton, Sir Banastre (1754-1833). An English soldier in the American Revolutionary War, born in Liverpool, and educated at Oxford. In 1776 he took part in Clinton's operations against Fort Moultrie (q.v.). Later in the year, under Sir William Erskine, he served in the successful operations in the vicinity of New York, and early in 1777 was with Cornwallis in New Jersey. With the army under Howe, the commander-in-chief, he took part in the battles of Brandywine and Germantown and the occupation of Philadelphia. In January, 1778, he was promoted captain, and in the following year was made lieutenant-colonel of 'the British legion,' a force of cavalry and light infantry, with which he very substantially aided the British cause in the South until the fall of Yorktown in October, 1781. He was an able and intrepid cavalry leader, but gained a reputation for cruelty until 'Tarleton's quarter' came to mean general butchery. Dispatched by Cornwallis, he defeated with great slaughter the superior force of Lieutenant-Colonel Burford at Waxham Creek, May 29, 1780; he routed a part of General Gates's force at Camden, August 16th, and defeated General Sumter at Catawba Fords, August 18th. Three months later he was defeated by Sumter, and, January 17, 1781, by General Morgan at Cowpens. He was with Cornwallis at the final surrender and returned to England in 1782. Representing the opposition, he was elected to Parliament in 1790, where he remained, excepting a brief interruption in 1806-07, until 1812. He was made major-general (1794), Governor in Berwick and Holy Island (1808), general (1812), and baronet (1815). He wrote a *History of the Campaigns of 1780 and 1781 in the Southern Provinces of North America* (1787), a work marred by vanity and partisanship.

TARL′TON, Richard (?-1588). A noted English comedian of Queen Elizabeth's time. Little is known of his life, but he is said to have been born in Shropshire and to have been at one time keeper of a public house. As an actor he became in 1583 one of the Queen's players who were called Grooms of the Chambers. A *platt* (or plot) exists of the second part of a play named *The Seven Deadlie Sinns*, as arranged by Tarlton, the dialogue of which was probably largely extemporized. He won such reputation for his constant jesting that his name was attached to many of the witticisms of the day, as well as to ballads and other pieces whose authors thus aimed to profit by his popularity. A collection of jokes called *Tarlton's Jests* was published a few years after his death; republished as edited by Halliwell for the Shakespeare Society in 1844, with *Tarlton's Newes out of Purgatorie*, which had appeared in 1590, in the form of a message from the dead actor in the other world.

TARN, tärn. A southern department of France, in Languedoc, bounded on the north by the departments of Aveyron and Tarn-et-Garonne (Map: France, J 8). Area, 2217 square miles; population, in 1891, 346,739; in 1901, 332,093. The surface is in general elevated and well wooded, and is watered by the river Tarn. In the south and southeast are offshoots of the Cévennes. Coal, iron, copper, and lead are mined and there are lucrative deposits of gypsum and porcelain clay. The vine is extensively cultivated, and there are manufactures of spirituous liquors, woolens, cottons and silks, iron, leather, and paper. Albi is the capital.

TARN-ET-GARONNE, ā gȧ'rŏn'. A southern department of France, formed mainly out of the old Province of Guienne (Map: France, H 7). Area, 1436 square miles; population, in 1891, 206,596; in 1901, 195,669. The surface is marked by plateaus with an average altitude of 1000 feet, the highest hills not rising above 1600 feet. The principal rivers are the Garonne and its affluents, the Tarn and Aveyron. Cereals are raised in great quantities, and the grapevine and mulberry are extensively cultivated. Mules and poultry are raised; coal and iron are mined; marble is quarried, and there are manufactures of woolens, linens, silk, iron, cutlery, and beet sugar. Capital, Montauban.

TARNOPOL, tär′nō-pôl. A town of Galicia, Austria, 76 miles east of Lemberg, on the Sereth (Map: Austria, J 2). Among the industrial establishments are refineries for spirits, breweries, and steam mills. The population of the commune in 1900 was 32,082, about half Poles and half Jews.

TARNOVSKI, tär-nŏv′skĭ, Stanislav, Count (1837—). A Polish historian of literature, born at Dzikov, Galicia. He studied in Cracow and Vienna, spent nearly two years in confinement, implicated in the revolt of 1863, was elected to the Galician Diet and the Austrian Reichsrat in 1867, then devoted himself entirely to literary studies, and in 1871 was appointed professor of Polish literature at the University of Cracow. In 1885 he became a member of the Austrian House of Lords, and in 1890 president of the Cracow Academy of Sciences. With Szujski he established the conservative *Przeglad Polski*, in which he published many of his literary monographs, distinguished by thoroughness, keen judgment and elegance of style. His writings include a *History of the Pre-Christian Era*, essays *On the Polish Novel in the 19th Century* and *On the Decadence of Polish Literature in the 18th Century, On the Comedies of Fredro, Schiller's Dramas, Shakespeare in Poland*, but above all his valuable principal work, *Studya do historyi literatury polskiéj* (Studies in the History of Polish Literature, 1886-92).

TARNOW, tär′nŏv. A town of Galicia, Austria, 137 miles west of Lemberg, on the Dunajec, near its confluence with the Biala (Map: Austria, G 1). The chief manufactures are of agricultural implements; there are steam, flour, and saw mills. The population of the commune, in 1900, was 33,974, of whom nearly two-thirds were Poles and the remainder Jews.

TARO. A popular name for *Colocasia antiquorum*, and especially for its variety esculentum, a native plant of India which is cultivated in warm climates, especially in the islands of the Pacific, where it forms a principal food. Its starchy, stem-like tuberous root is boiled or baked, made into bread or into poi, a fermented product. The young leaves and tender leafstalks are used respectively like spinach and asparagus.

TARPAN. The Mongolian name for the wild ass, kiang, or dziggetai, of the high plateaus of Central Asia. See Ass.

TARPEIAN (tär-pē′yan) **ROCK** (Lat. *Rupes Tarpeia*). The name applied to a portion of the southern part of the Capitoline Hill in Rome. According to tradition, in the time of Romulus, Tarpeia (a vestal virgin), the daughter of Tarpeius, governor of the Roman citadel on the Capitoline, covetous of the golden ornaments of the Sabine soldiery, and tempted by their consent to give her what they wore on their left arms, opened a gate of the fortress to the Sabine King, Titus Tatius, who had come to revenge the rape of the Sabine women. The Sabines crushed Tarpeia to death beneath their shields, and she was buried in the part of the hill which bears her name. From early times criminals were frequently put to death by being hurled from the Tarpeian rock. The whole southern end of the Capitoline is marked by scarped cliffs, the height of which has doubtless been much diminished by the accumulation of débris at the foot. It is impossible to determine precisely what portion of these cliffs is the true Tarpeian Rock.

TARPON (from the North American Indian name), or Tarpum. A great herring-like fish (*Tarpon Atlanticus* or *Megalops thrissoides*) of the West Indies and neighboring waters, which, with a few other species scattered about the tropical world, represents the isospondylous family Elopidæ. This fish is regarded by many anglers as affording sport with a rod and line superior to that given by any other fish. The tarpon (see Colored Plate of American Game Fishes, accompanying article Trout) has something the shape of a salmon, and great power in swimming and leaping. It is often six feet in length and may weigh 100 pounds. It preys upon other fishes and small fry. The flesh is poor and not much valued as food, but the great silvery cycloid scales are much used in ornamental work. Another species of the family, the 'ten-pounder' (*Elops saurus*), is about half as large; it is abundant about all tropical coasts, and is known under a great variety of names.

TARPON FISHING. The sport of angling for tarpon (q.v.) with rod and line is the most skillful and exciting which America affords. The angler goes in a small boat some distance from shore, with an experienced man to row it, and uses a heavy rod, 7½ to 8 feet long, with a multiplying reel, 200-250 yards of linen line, and a spoon-bait. When a fish weighing perhaps 100 pounds seizes this, and begins those rushes and mighty leaps which have given the 'silver king' the just title of 'greatest of game fishes,' the power and science of the angler are both tested in the highest degree. Excellent tarpon-fishing may usually be obtained all around the southern coast of Florida and its reefs; and also along the coast of Texas. Consult American books mentioned under FISH; and ANGLING.

TARQUIN′IUS. The family name of two kings of Rome, with whose history, or rather with the legends regarding whom, the fortunes of the city are closely interwoven. Demaratus, a Corinthian noble, emigrated from Greece, and settled at Tarquinii, in Etruria, where he married an Etruscan wife. A son, Lucumo, married into a noble Etruscan family, and emigrated to Rome, where he was hospitably received and soon after admitted to the rights of citizenship. He took the name of Lucius Tarquinius, or, according to Livy, L. Tarquinius Priscus. The Roman monarch, Ancus Marcius, appointed him guardian of his children; and on the death of the King (B.C. 616), the senate and the citizens unanimously elected Tarquinius to the vacant throne. His reign was a glorious one. He waged successful wars, forcing the whole of the twelve sovereign cities of Etruria to recognize his supremacy and do him homage. To him, also, are ascribed the construction of the magnificent *cloacæ*, or sewers, the laying out of the Circus Maximus, and the building of shops (*tabernæ veteres*) on the Forum; the institution of the Great or Roman Games; and the foundation of the Capitoline temple. Tarquinius was assassinated after a reign of thirty-eight years (B.C. 578) at the instigation of the sons of Ancus Marcius, who considered themselves as best entitled to the throne. But their crime did not avail them, for Servius Tullius, his nephew, was elected to the vacant throne.—LUCIUS TARQUINIUS SUPERBUS, son of Lucius Tarquinius, having murdered his father-in-law, Servius Tullius, is represented in the legend as audaciously usurping the vacant throne (B.C. 534); but as the whole drift of his legislative policy was to abolish the reforms of Servius; there can be little doubt that the real significance of this part of his career lies in the fact that it indicates a successful reaction, on the side of the patricians, against the more liberal and progressive policy of the preceding age. That the younger Tarquinius, at least, is an historical character, seems to be pretty generally allowed. As far as we can gather from the ancient annals, the usurpation of Tarquinius was probably achieved by the help of an enterprising section of the nobles, who clung tenaciously to their privileges, and could not endure the constitutional recognition of the *plebs*. By means of subtle and unscrupulous intrigues he obtained or consolidated the Roman hegemony in Latium; offered sacrifice in the name of all the Latins at the Alban Mount; fused the contingents of the Latins with the Roman legion; put to death as traitors such of their chiefs as opposed him; and, at the head of the combined forces, successfully attacked the Volscians. On his return he completed the building of the temple of Jupiter Capitolinus, which the elder Tarquinius had begun, and deposited in the vaults the Sibylline books he had curiously acquired. (See SIBYL.) But his lavish expenditure both in war and peace necessitated the imposition of heavy taxes, and the patience both of plebs and patricians was beginning to give way. During a war against the Rutuli Tarquinius laid siege to the town of Ardea. Here in the Roman camp occurred the famous dispute between Sextus Tarquinius, the son of the King, and Collatinus, about the virtues of their respective wives, which led to the rape of Lucretia (q.v.). L. Junius Brutus (q.v.) carried the news of the outrage to Rome and called upon the people to rise against the tyrant, who was deposed by the senate; finally, the army before Ardea revolted. Tarquinius and his sons were obliged to flee, and an aristocratic republic was constituted at Rome (B.C. 509). Three different attempts were made to restore Tarquinius by force: first, by his own Etruscan kinsmen of Tarquinii; second, by Lars Porsena (q.v.) of Clusium; and third, by his son-in-law, Octavius Mamilius. All these, according to the legend, failed; and at length Tarquinius, utterly baffled and beaten, retired to Cumæ, where he died.

TARR, RALPH STOCKMAN (1864—). An American educator, born at Gloucester, Mass. He was educated at Lawrence Scientific School, Harvard, and was assistant professor of geology at Cornell University from 1892 to 1896, when he became professor of dynamic geology and physical geography in the same institution. Besides acting as associate editor of the *Bulletin of the American Geographical Society* and the *Journal of Geography*, he published: *Economic Geology of the United States* (1893); *Physical Geography of New York State* (1902); *New Physical Geography* (1903); and several text-books on geography.

TARRAGON. A garden herb. See ARTEMISIA.

TARRAGONA, tär′rȧ-gō′nȧ (L. *Tarraco*). A seaport of Spain, capital of the province of the same name, in Catalonia, situated on the Mediterranean at the mouth of the Francolí, 63 miles southwest of Barcelona (Map: Spain, F 2). On the land side it is bordered by the beautiful *Campo de Tarragona*, whose agricultural products form an important part of its trade. The local industries embrace manufactures of alcohol, liquors, soap, flour, silks, and paper, and salted fish. Since 1892 it has been an important port of entry. The town contains a normal school for both sexes, a museum of archæology, and several hospitals. The nucleus of the old city is situated on a steep hill, now crowned by the cathedral and the bishop's palace. Population, in 1900, 26,281. The city was probably founded as a Greek colony. Under the Romans it enjoyed a prominent position from the time of the Scipios, being at one time a residence of Augustus. It gave its name to the Province of Hispania Tarraconensis. From this period still survive a portion of the ancient wall, with 'cyclopean' remains, an amphitheatre, the ruins of the palaces of Augustus and of Pontius Pilate, and an aqueduct still in use. The city was destroyed by the West Goth Euric (475). It was taken by the Arabs in 713 and partially destroyed, but was restored by Abd-ur-Rahman (780). In the twelfth century it was taken by the Christians and became an archiepiscopal see. In 1811 it underwent a siege and sack by the French under Suchet.

TARRASA, tȧr-rä′sȧ. A town in the Province of Barcelona, in Catalonia, Spain, 22 miles northwest of the city of Barcelona, on the Barcelona-Lérida line of the Northern Railway (Map: Spain, F 2). It is an important industrial centre, with manufactures of cotton and woolen cloths. The Romanesque churches of San Pedro and San Miguel date from the Christian reconquest, but most of its structures are modern, including a large royal college, industrial schools, chamber of commerce, and two theatres. The population, in 1900, was 15,872.

TARRASCH, tär′räsh, Siegbert (1862—). A German chess master, born in Breslau. He was educated in medicine at the universities of Berlin and Halle, and practiced his profession in Nuremberg, where in 1883 he won his mastership in chess. His success in chess continued, and at the international tournaments in Breslau (1889), Manchester (1890), and Dresden (1892), he won the first prize with only a single game lost. At the tournament held in 1898 at Vienna he tied with the American, Pillsbury, for first prize, winning on the play-off; and he was sixth at the International Masters' Tournament held at Monte Carlo in 1902. He became distinguished for careful play and ingenious combinations. An edition of 300 of his games, edited and analyzed by himself, appeared in 1894.

TAR′RYTOWN. A village in Westchester County, N. Y., 25 miles north of New York City; on the east side of Tappan Bay, an expansion of the Hudson River, and on the New York Central and Hudson River Railroad (Map: New York, G 4). It is picturesquely situated on ground rising from the river and is an attractive residential place. The vicinity of the village, which has been made famous by Washington Irving (see Sleepy Hollow), is of great interest also through its connection with the history of the Revolutionary period. Irving's burial place is in the graveyard of the old Dutch Church, about three-fourths of a mile north of the village. The Dutch Church, dating from 1699, and the Philipse Manor House, built in 1683, are the most noteworthy of the older buildings. Other features of Tarrytown include Miss Mason's School, familiarly known as the 'Castle,' the Tarrytown Lyceum, with a library of more than 4000 volumes, the Institution of Mercy (Catholic), and Irving Institute. Drill and automobile works are the leading industrial establishments. The government is vested in a president and board of trustees, who hold office respectively for one year and two years. The water-works are owned and operated by the village. Population, in 1890, 3562; in 1900, 4770.

The name Tarrytown is said to have been derived from the hypothetical first settler, one Terry, who came in 1645. In 1683 Vredryk Flypse (Frederick Philipse) moved here and ten years later secured manorial rights to the adjacent territory. Major André was captured here on September 23, 1780. About two miles south of the village, at Irvington, is Sunnyside, the home of Washington Irving. Tarrytown was incorporated in 1870. Consult: Bacon, *Chronicles of Tarrytown and Sleepy Hollow* (New York, 1897); and a sketch by Hamilton Wright Mabie in Powell's *Historic Towns of the Middle States* (New York, 1899).

TARSHISH, tär′shĭsh. According to the Old Testament, a region which was the resort of Phœnician commerce, and the source of valuable mineral products. The earliest mention is in Genesis x. 4, where it is associated with lands probably identical with Crete, Cyprus, and Rhodes. Its special trade was with Tyre, which seems to have had there a colonial factory (cf. Isa. xxii.; Ezek. xxvii. 12, 25). Certain texts, however, seem to oppose this western location. 'Ships of Tharshish' are mentioned as starting from Solomon's port at Ezion-geber (q.v.) on the Red Sea (I. Kings x. 22; xxii. 48); while the Chronicler (II. Chron. ix. 21; xx. 36-37) makes them go to Tarshish from that point. Hence has arisen the view that the Hebrews and Phœnicians circumnavigated Africa, or else that there was an Oriental land of Tarshish in addition to the Occidental one. 'Ship of Tarshish,' however, is now generally supposed to mean some kind of large vessel designed for distant voyages. It is also possible, as held by some, that Phœnician ships were transported across the Isthmus of Suez. No identification of this Western Tarshish has yet been accepted by scholars. The oldest view identifies it with the Tartessus of Herodotus (iv. 152), Strabo (ii. 158), and other Greeks, at the mouth of the Guadalquivir, near Cadiz; and the southern part of Spain in general is largely accepted as the region of Tarshish. The location in Spain would agree with the products assigned to Tarshish, silver, iron, lead, while the tin may have been brought thither from the British Isles. Also the jewel called the stone of Tarshish, or simply a tarshish (translated beryl in Exodus xxviii. 20, and elsewhere), may represent one of the numerous precious stones found in Spain. On the ground of etymological comparison, the Tyrrhenian or Etruscan region is accepted by some scholars, and it is to be observed that the term is always used vaguely. Consult: Bochart, *Geographia Sacra* (Caen, 1646); Ritter, *Erdkunde* (Eng. trans. *Comparative Geography*, vol. i., Edinburgh, 1886); Meyer, *Geschichte des Altertums*, vol. i. (Stuttgart, 1884); Renouf, in *Proceedings of the Society of Biblical Archæology*, vol. xvi.; Winckler, *Forschungen*, vol. i. (Leipzig, 1893); Cheyne and W. M. Müller, in *Orientalische Litteraturzeitung*, vol. iii.; Haupt, in *Proceedings of Thirteenth International Congress of Orientalists.*

TARSIA-WORK (It., from Gk. *ταρσός*, *tarsos*, frame of wickerwork). A beautiful kind of marquetry made in Italy. It is produced by inlaying pieces of tinted or natural woods, so as to represent figures and landscapes. That of Sorrento is very celebrated. It is usually applied to the decoration of cabinet-work, and was largely used during the sixteenth century.

TARSIER (Fr. *tarsier*, from Neo-Lat. *Tarsius*, from *tarsus*, from Gk. *ταρσός*, broad surface, primarily for drying, also *ταρσὸς ποδός*, *tarsos podos* flat of the foot, from *τέρσεσθαι*, *tersesthai*, to dry), or Malmag. A small East Indian animal (*Tarsius spectrum*), closely related to the lemurs, but set apart in a family Tarsiidæ, which inhabits trees in the Malayan and Philippine archipelago and has the general habits of a lemur. It is nowhere common, is nocturnal, and feeds upon insects and small reptiles. In size it is about as large as a rat, has a large, broad head, with very large eyes, teeth of a generalized type, very long half naked hind legs and short fore legs, and the long bony toes end in large pads beneath the terminal joints. The tail is long and tufted at the end. It moves about by long leaps from bough to bough. Compare

Galago and **Mouse-Lemur**; and consult authorities and Plate under **Lemur**.

TAR/SUS (Lat., from Gk. Ταρσός, *Tarsos*, Ταρσοί, *Tarsoi*). The chief city of ancient Cilicia, and of Eastern Asia Minor, situated on both sides of the navigable river Cydnus, in the midst of a beautiful and productive plain, about 10 miles from the sea. From its situation Tarsus commanded the pass over Mount Taurus, the Cilician Gates, which formed the only means of communication with Northern and Western Asia Minor, and in almost equal measure the route to Northern Syria and the East by the Amanian or Syrian Gates. The first mention of the place as Tarzi is on the Black Obelisk of Shalmaneser II., about the middle of the ninth century B.C., where its capture by the Assyrians is recorded. It was the capital of the Kingdom of Cilicia, which was long ruled, under Persian suzerainty, by a line of kings who bore the hereditary name of Syennesis, and later was the residence of a Persian satrap. With the conquest of Alexander the Great, it passed into Greek hands, and during the following period was usually in the power of the Seleucidæ of Syria. At the end of that century it passed under the Roman supremacy, and upon the organization of the Province of Cilicia (B.C. 64) it became the capital. Later, Mark Antony made it a free city, and it was here that in B.C. 38 he was visited by Cleopatra. Under the Empire the free city seems to have enjoyed a popular form of government with a property qualification for the franchise. This gives additional point to the claim of the Apostle Paul—a native of this place—to be a citizen of Tarsus, as that implied a certain social position. It was a place of consequence even in Byzantine times, but suffered from its proximity to the Syrian frontier. The modern town, though large, is dirty and mean, containing no vestige of its ancient splendor, and but few ruins. The most conspicuous ruin is the large concrete foundation of a Roman building, popularly called the Tomb of Sardanapalus.

TARTAGLIA, tär-tä′lyȧ, Nicoló (1500-1557). An Italian physicist and arithmetician whose real name was Nicoló Fontana. He was born at Brescia, lectured at Verona, and became professor of mathematics at Venice. Tartaglia first became generally known through his solution of cubic equations, and from his suggestions Cardan (q.v.) probably derived the solution known as Cardan's method. His work in physics is preserved in his *Nuova scienza* (1537; French trans., 1845-46), showing that he studied the theory of falling bodies and investigated the range of projectiles at various angles. His treatise on arithmetic, *General trattato de numeri et misure* (1556-60), is the chief authority on the Italian methods of his time. *Quesiti et inventioni dierse de Nicoló Tartaglia* (1546) is also well known.

TAR/TAK. According to II. Kings, xvii. 31, the name given to a deity worshiped by the Avites, who were transferred to Samaria by the Assyrian King after the destruction of the northern Hebrew kingdom. Jewish tradition represents Tartak as worshiped under the form of an ass (*Tal. Bab., Sanhedrin* 63). No such deity as Tartak has been found in the Babylonian or Assyrian literature.

TARTAN (Fr. *tiretaine*, *tirtaine*, linsey-woolsey, from Sp. *tiritaña*, thin silk or woolen cloth, from *tiritar*, to shiver). A well-known cloth of checkered pattern, also called plaid. The Scottish Gaelic *tartan* is a loan-word from the English; the native name is rather *breacan*. These colored plaids have long been in great favor in the Highlands of Scotland, where each clan wears a particular kind as its distinctive dress. Consult: Skene, *The Highlanders of Scotland* (new ed. by Alexander Macbain, 1901); Grant, *Clan Tartans* (1886).

TARTAR (ML. *tartarum*, MGk. τάρταρον, tartar, probably from Lat *Tartarus*, from Gk. Τάρταρος, Tartarus, Hades; hardly from Ar. *durd*, *ḍurdīy*, dregs, from *darida*, to loose the teeth, in allusion to the action of tartar on the teeth). A mixture of bitartrate of potash and tartrate of lime, deposited from wine and known in its crude form as argol.

TARTAR EMETIC. A name applied to the double tartrate of potassium and antimony, $K(SBO)\ C_4H_4O_6+\frac{1}{2}H_2O$. It is prepared by making a paste of antimonious oxide, acid potassium tartrate and a little water, allowing to stand for several hours, then boiling the paste with water, and allowing the resulting solution to crystallize. Tartar emetic has a sweet taste, but leaves a disagreeable after-taste in the mouth. It is moderately soluble in water, but is insoluble in alcohol. It has a powerfully irritating effect on the alimentary canal, and thus readily causes vomiting; but vomiting is also due to the action of the compound upon the medulla, after being absorbed into the blood. Owing chiefly to its depressing effect on the heart and nervous system, it is now much less used than formerly.

TARTARIC ACID, $C_4H_6O_6$. An acid compound of carbon, hydrogen, and oxygen, of which four different modifications are known. Ordinary tartaric acid is usually seen in the form of colorless, transparent crystals, which are not affected by the action of the air, have an agreeable acid taste, and are soluble in water and alcohol. The crystals when gently warmed become strongly electric, the opposite sides of the crystals exhibiting the opposite forms of electricity. On heating tartaric acid to about 167-170° C. it fuses; and at slightly higher temperatures it becomes changed into *metatartaric*, *tartralic*, and *tartrelic* acids.

Tartaric acid occurs abundantly in the vegetable kingdom both in the free and combined states. It is, however, from argol (q.v.), a product of the fermentation of grape juice, that the tartaric acid of commerce is obtained. Argol, or crude tartar, is boiled with water and hydrochloric acid, and the solution is precipitated with lime. The insoluble tartrate of calcium thus obtained is purified by washing with water, then decomposed by treating with sulphuric acid. This transforms the tartrate into the sparingly soluble calcium sulphate; white tartaric acid goes into solution in the free state. The filtered liquid, when cooled and evaporated, yields crystalline tartaric acid.

Being a dibasic acid, tartaric acid can form both acid and neutral salts. The most important tartrates are the following: *Neutral potassium tartrate*, $K_2C_4H_4O_6$, a soluble salt, which crystallizes with half a molecule of water. *Acid potassium tartrate,* or *bitartrate of potash,* $KHC_4H_4O_6$, is prepared from argol by extraction with boiling water and filtering the solution thus obtained through charcoal. The salt crystallizes readily as the hot solution cools. The snowy white rhombic prisms which are thus deposited constitute *cream of tartar,* which is moderately soluble in cold water and but sparingly soluble in alcohol. It is an excellent saline purgative and diuretic and is therefore largely used in medicine. *Calcium tartrate,* $CaC_4H_4O_6 + 4H_2O$, is practically insoluble in cold water and but sparingly soluble in hot water. The insolubility of the acid tartrate of potassium and of the tartrate of calcium often helps to identify tartaric acid. *Tartar emetic* is described in a special article.

Tartaric acid has been known since the earliest times, in the form of tartar; Scheele was the first to obtain the acid in the free state and to determine its principal properties (1769). Like any other acid, tartaric acid promotes the secretion of saliva, and may therefore be used to allay thirst. When taken internally it is decomposed in the blood with formation of alkaline carbonates, which cause an increase of the alkalinity of urine.

A remarkable modification of tartaric acid is known as *racemic* or *paratartaric acid,* $C_4H_4O_6 + 2H_2O$. It is a frequent associate of tartaric acid, but is especially abundant in the grapes of the Vosges district. While in most respects it exhibits a close resemblance to tartaric acid, it crystallizes more readily from solution; contains two equivalents of water of crystallization; is less soluble in alcohol; and the racemate of lime is soluble in hydrochloric acid, and is precipitated unchanged on adding ammonia. Its most important difference, however, is that its solution does not rotate the plane of polarized light, while a solution of ordinary tartaric acid exerts a well-marked right-handed rotation. Pasteur proved that racemic acid is a mixture of ordinary tartaric acid (to which, from its optical property, he applies the term *dextro-racemic acid*) and of an acid which produces left-handed rotation, to which he gives the name *lævo-racemic acid.* (These acids are also known as *dextro-tartaric* and *lævo-tartaric acids*). He found that, by saturating racemic acid with soda and ammonia, and allowing this solution to crystallize slowly, two varieties of crystals are obtained, which may be distinguished by their form, in the same way as the image and the reflection of the image in a mirror differ, or as right-handed and left-handed. If the two kinds of crystals are separated, and then dissolved, each solution is found to act powerfully on polarized light, but in opposite directions. On separating these acids from their bases, and mixing equal parts of concentrated solutions of each, racemic acid is again formed, which exerts no action on a polarized ray.

Besides the three modifications mentioned above, viz., ordinary or dextro-tartaric acid, lævo-tartaric acid, and racemic acid, a fourth modification of the same chemical composition and constitution, known as *meso-tartaric,* anti-tartaric, or inactive tartaric acid, has been obtained. It may be prepared by heating, in a sealed glass tube, 30 grams of ordinary tartaric acid with 3 or 4 cubic centimeters of water, at 165° C., for about 48 hours. In the anhydrous state it melts at about 140° C.; usually, however, it is obtained in the form of crystals having the composition $C_4H_6O_6 + H_2O$. It is very soluble in water. Its acid potassium salt, too, is very soluble in water, and its calcium salt crystallizes with 3 molecules of water: $CaC_4H_4O_6 + 3H_2O$. The different modifications of tartaric acid have also been prepared synthetically. Their relation to one another has been explained stereo-chemically. See STEREO-CHEMISTRY.

TARTARIN, tär'tȧ'răɴ'. The hero of three tales by Alphonse Daudet, *Tartarin of Tarascon* (1872), *Tartarin on the Alps* (1885), and *Port-Tarascon* (1890). The boastful, expansive, childlike Tartarin personifies the Gascon type, with which Daudet was intimately familiar.

TARTARS. See TATARS.

TAR'TARUS (Lat., from Gk. Τάρταρος). According to Homer, a deep and sunless abyss, as far below Hades as earth is below heaven, and closed in by iron gates. Into Tartarus Zeus hurled those who rebelled against his authority, e.g. Cronos and the Titans. It is to be noted that such typical sinners as Tityos, who offered violence to Leto, and after his death by the arrows of Apollo and Artemis was condemned to have his liver perpetually eaten by vultures, or Sisyphus (q.v.), Tantalus (q.v.), and Ixion (q.v.) are represented in the earlier poems as suffering in sight of the other shades. In the later conception, when the idea of a judgment in the other world and a separation between the good and bad had become well developed, Tartarus became the place of punishment for all sinners.

TAR'TARY (properly *Tatary*). The name which, in the Middle Ages, was applied to the central part of Eurasia. In later times a distinction was made between European and Asiatic Tartary, the former comprising that part of Russia which was once the Khanate of the Crimea. The term Asiatic Tartary, first applied to the whole of Central Asia, has gradually been confined to the independent portion of Turkestan.

TARTE, tärt, JOSEPH ISRAEL (1848—). A Canadian statesman. He was born in the Province of Quebec, was educated at L'Assomption College, and was admitted to the bar in 1871. Afterwards he became editor of *Le Canadien* and then of *L'Evénement,* in Quebec. Politically he was a Conservative until 1891, but after that date he supported the Liberals. He was a member of the Legislative Assembly of Quebec in 1877-81, and became one of the active political organizers of his party in that province. As the avowed foe of jobbery and corruption in every form, he had already given dissatisfaction by his criticism of certain politicians and measures; but after his election to the Dominion House of Commons in 1891, as an Independent Conservative, he vigorously attacked the administration of Sir John A. Macdonald, his political chief, alleging corrupt practices by Ministers. This compelled him to sever his connection with the Conservative Party, and when the Laurier administration came into power in 1896 he was appointed Minister of Public Works. He held that position until 1902.

TARTINI, tär-tē′nē, Giuseppe (1692-1770). An Italian violinist, composer, and theoretician, born at Pirano, Istria. He discovered the combination tones, about 1714, and used them in making perfect purity of intonation. His fame rapidly increased and in 1721 he was made solo violinist and conductor of the orchestra at Sant' Antonio in Padua. From 1723 to 1725 he was chamber-musician to Count Kinsky at Prague. Afterwards he again took up his duties at Padua and founded a violin school there in 1728, which acquired a world-wide reputation. His compositions include numerous classical concertos, sonatas, and other compositions for the violin, and the best-known of his theoretical works are: *Trattato di musica secondo la vera scienza dell' armonia* (1754); *De' principj dell' armonia musicale contenuta nel diatonico genere* (1767); and *L'arte dell' arco,* reprinted in Choron, *Principes de composition,* vol. vi. (Paris, 1816). Consult Fayolle, "*Notices sur Corelii, Tartini,*" etc. (Paris, 1810).

TARTUFE, tår′tụf′, or **TARTUFFE.** The name of Molière's most celebrated comedy and of the chief character in it, who has become the type in all languages for a hypocritical scoundrel carrying out his evil designs under the cloak of religion. In the play, Tartufe ingratiates himself with a simple-minded gentleman named Orgon, and nearly ruins both him and his family before being discovered. Conflicting stories are given as to the original of the character. The name is said to have suggested itself to Molière on the occasion of a visit to the Papal Nuncio, where he saw the pious and solemn countenances of the Nuncio's courtiers suddenly lighted up with ecstatic animation by the appearance of a seller of truffles—in Italian, *tartuffoli. Tartufo* has also been found used in Italian figuratively for an ill-disposed person, in allusion to the fancy that truffles were a diseased product of the earth. The play was written in 1664, presented once in 1667, then prohibited, and it was not until 1669 that Molière succeeded finally in getting the King's consent, after which the piece had an uninterrupted run for three months.

TARUDANT, tä′ro͞o-dänt′. The capital of the Province of Sus, Morocco, situated between the base of the Atlas Mountains and the Sus River, 125 miles southwest of Morocco. The surrounding country is highly cultivated and the city, walled and defended by a citadal, contains many fine mosques, groves, and gardens. The streets are narrow and crooked and most of the houses have but one story. Copper, gold, silver, and iron ores are mined in the vicinity and the chief industries are the manufacture of copper articles for Central Africa, tanning, leather-dressing, and dyeing. Population of the town, about 8500; of the district, 30,000.

TARUMÁ, tä′ro͞o-mä′. A tribe of Arawakan stock (q.v.) on the headwaters of the Essequibo River, British Guiana. They came originally from the Rio Negro, Brazil. They are of medium stature, but well formed. Their language differs so much from the cognate dialects that it was formerly thought to constitute a distinct stock.

TARUMARI, tä′ro͞o-mä′rē, or Tarahumari. A numerous tribe of Piman stock (q.v.) occupying the Sierra Madre region of Central and Southern Chihuahua, and extending into the adjacent sections of Sonora and Sinaloa, Mexico. No reliable statement of their number can be given, but they are variously estimated at from 50,000 to 100,000. On account of the broken character of the country which they inhabit, there is no central organization, each little valley settlement managing its own affairs under a local chief or 'governor.' The language is spoken in several dialects and the people generally are classed by the Mexicans as Christians in the north and 'gentiles' or heathen in the south. Although peaceful and unwarlike in character, the Tarumari have several times revolted against the Spaniards and the Mexicans. In 1648 they rose up and destroyed all the missions, drove every Spaniard out of their territory, and maintained a successful resistance for four years under their chief Teporaca. In 1690 they again rebelled, destroyed the missions, mines, and haciendas, and massacred all the Spaniards, but were finally subjugated in 1692. A local insurrection in the neighborhood of Temosachic, northwest of Chihuahua City, in 1895, led by a native prophetess, was suppressed only after a bloody massacre by Mexican troops.

Physically, the Tarumari are very dark and rather undersized, resembling the Pueblo Indians, and, like them, they are of remarkable strength and endurance. They are fond of music and singing, make pottery and weave elaborate girdles of native cotton, although the men ordinarily go naked except for a cloth about the loins. They are sedentary and semi-agricultural, but depend largely also upon hunting, fishing, and wild products. Much attention is given to the corn crop, nearly all their ceremonial dances being more or less invocations or thanksgiving for rain. They have a feast of the dead a year after the funeral, and are devoted to the peyote rite, going hundreds of miles on foot to procure supplies of the cactus. Their houses are small thatched huts of logs or stones laid in clay mortar, and they frequently utilize the mountain caves for dwelling purposes.

TASCHEREAU, tåsh′rō′, Elzéar Alexandre (1820-98). A Canadian prelate and cardinal, born in the Province of Quebec. He was educated at the Quebec Seminary, with which, after his ordination to the priesthood in 1842, he remained connected for nearly thirty years, first as professor of moral philosophy and from 1860 as director. In 1862 he was made vicar-general of the diocese, and archbishop in 1871. In 1886 he became a cardinal, the first Canadian member of the Sacred College.

TASCHEREAU, Jules Antoine (1801-74). A French author and statesman, born at Tours. He studied law at Orleans, and then entered journalism in Paris. He was for a time the editor of the *National;* served in the magistracy; and in 1833 founded the *Revue rétrospective,* devoted to the collection of documents upon history and literature (20 vols., 1833-37). In 1837 he was elected to the Chamber of Deputies. He sat in the Constituent Assembly, and then in the Legislative Assembly; supported the Empire, and was rewarded with a place in the National Library, of which he in time became director. Among his published works are: *Histoire de la vie et des ouvrages de Molière* (1825); and *His-*

toire de la vie et des ouvrages de P. Corneille (1829).

TASHKENT, tȧsh-kĕnt′, or **TASHKEND.** The capital of the Governor-Generalship of Russian Turkestan and of the Territory of Syr-Darya, as well as one of the most important cities of Central Asia, situated near the Tchirtchik, a feeder of the Syr-Darya, about 150 miles northeast of Samarkand (Map: Asia, F 4). It consists of the new Russian city, built up since the Russian occupation, and the old native city. The former is well laid out, abounds in private gardens, and compares favorably in regard to public buildings and educational institutions with most cities of European Russia. It has a library rich in works on Central Asia. The native city is still partly surrounded by walls and is Oriental in appearance, with its narrow crooked streets and low houses turning toward the street their blind walls. Tashkent manufactures leather goods, textiles, metal articles, and footwear. Agriculture and gardening are carried on. The trade has greatly increased in importance since the connection of the city with the Caspian Sea by rail. Population, in 1897, 156,414, consisting chiefly of Sarts, Tatars, Kirghizes. The Russians number about 25,000. The first trustworthy mention of Tashkent dates from the seventh century, although local traditions attribute to the city very great antiquity. The town has been in possession of Russia since 1865.

TASK, The. A descriptive and didactic poem in blank verse by William Cowper, written in the summer of 1783 at the suggestion of Lady Austin, who had jestingly proposed a sofa as a possible subject for the poet's muse and had thus started him upon his task. The six books are called "The Sofa;" "The Timepiece;" "The Garden;" "The Winter's Evening;" "The Morning Walk;" "The Evening Walk." It was first published, together with the *Epistle to Joseph Hill, Tirocinium,* and *John Gilpin,* in London, July, 1785.

TASMAN, täs′măn, Abel Janszoon (c.1602-59). A Dutch explorer. He was born at Lutgegast, near Groningen, and early went to sea. He made two important voyages of discovery in the Pacific. In 1642 he left Batavia in command of an expedition sent out by Van Diemen, Governor-General of the Dutch East India Company, to circumnavigate the Australian continent. During his voyage of ten months he discovered (November 24, 1642) Tasmania—which he called Van Diemen's Land—New Zealand, and the Friendly and Fiji Islands. After publishing an account of his voyage, which was reprinted in 1722 (2d ed. by Jacob Swart, 1860), he made a second voyage to New Guinea and New Holland and discovered the Gulf of Carpentaria. His life was written by Dozy, in his *Bijdragen tot de Taal-, Land-, en Volkenkunde van Nederlansch.Indie* (1887), and by Walker (Hobart, 1896).

TASMA′NIA. A State of Australia occupying the island of Tasmania with its neighboring islands. The island of Tasmania, formerly called Van Diemen's Land, lies between latitudes 40° 33′ and 43° 39′ S. and longitudes 144° 39′ and 148° 23′ E. It is separated from the southeastern portion of the Australian continent, the coast of Victoria, by Bass Strait, 140 miles wide; the Indian Ocean bounds the island on the west and the Pacific on the east, the two meeting at its southern extremity. Tasmania is of nearly triangular shape, measuring 200 miles from north to south and 245 miles from east to west. The area of the main island is 24,331 square miles, and of the State, including the smaller islands, 26,385 square miles.

Tasmania is an ancient plateau, which has been extensively and irregularly dissected by the action of running water. In the west central portion there still remains an extensive plateau region with a nearly uniform height of 3000 to 4000 feet, though some isolated peaks and ridges are scattered over it. In the northwest this plateau reaches an altitude of 5069 feet in Cradle Mountain, the highest point of the island. In the northeastern corner of the island there is a similar plateau remnant, but between the two there is a series of great valleys extending from the mouth of the Tamar in the north to that of the Derwent in the south and affording the route for the main railroad line. The remaining parts of the island are cut up into a maze of deep valleys and high ridges and peaks, often of a precipitous character. There are about 20 peaks over 4000 feet high scattered through nearly every part of the island. The coasts are generally bold, and in the southeast are irregularly indented with fiords and harbors suggesting, together with the generally lower level of the surrounding mountains and the outlying islets, a subsidence of the land in this direction.

The central plateau is studded with a number of mountain lakes of considerable size, most of which feed the Derwent River. The rivers of Tasmania are large and numerous considering the size of the island. The most important are the Derwent and Huon in the south, the Gordon in the west, and the Tamar in the north, all of which enter the sea through large, navigable estuaries.

The climate is more temperate and equable than that of the continent. At Hobart the mean temperature in summer is 62°, and in winter 47°, the extremes ranging to 100° and 29°. The rainfall varies greatly in the different localities, and depends largely on the degree of exposure to the west winds, which bring most of the moisture. In the east the general average is 22 inches, in the north 30 inches, and in the west 40 inches, though some western localities have had 100 inches of rain in a year. In the west and southwest, where the rocks are granitic and schistose, the soil is rather poor. In the central valley and in the northern and southeastern districts the Tertiary deposits have combined with volcanic detritus to form a very rich soil of a chocolate color.

The flora is essentially Australian, and closely related to that of Victoria. There are magnificent forests containing acacias and the gigantic eucalyptus, as well as other valuable timbers, such as the Huon pine (*Dacrydium Franklini*). The conifers are well represented, there being 9 species peculiar to the island, and of the 1100 species of angiosperms, or higher plants, over 250 are restricted to Tasmania. The fauna, though also distinctively Australian, includes several mammals unknown on the mainland. The most remarkable of these are two carnivorous marsupials, the Tasmanian wolf and the Tasmanian devil. See DASYURE.

The central table land and the western and southern portions consist mainly of Archæan granites, crystalline schists, and quartzites overlaid by much eroded Paleozoic rocks. Toward the coast Mesozoic and Tertiary formations appear, chiefly as sandstones, while throughout, but especially in the east, there are extensive volcanic outpourings, dikes of porphyry and greenstone, and large fields of basalt of Tertiary age. The latter, capping and protecting the softer sandstones, are largely responsible for the rugged and irregular nature of the surface. Considerable beds of coal and lignite appear in the Paleozoic and Mesozoic formations. Rich iron ores occur along the north coast, and tin, lead, plumbago, and some gold have been found in various parts of the island.

Copper is predominant. Beginning in 1896, the copper-mining developed rapidly, until in 1900 the value of the blister copper mined was £907,288 and copper ore £63,589. The production of gold more than doubled between 1891 and 1900, being valued at £316,220 in the latter year. The yield of silver ore in 1900 was valued at £279,372, which was much in excess of the average annual yield. The value of tin mined for the same year was £269,833, and of coal £44,227. The tin production exceeds that of any other Australian State. The lode mines of Mount Bischoff have become famous, but elsewhere the tin is got from alluvial deposits.

The total area under cultivation in 1901 was 560,151 acres. The cereal crops included: wheat, 51,825 acres; oats, 45,073 acres; corn, 9839 acres; and barley, 4502 acres. There were also 23,068 acres of potatoes, 306,181 acres of green fodder, and 61,541 acres of hay. There was an average yield of 18.9 bushels of cereals per acre for the decade ending with 1901. The island is exceptionally well suited to temperate zone fruits, and in 1901 there were 7888 acres in apples alone. The State is well adapted to stock-raising, but the industry has not shown much progress for several years. In 1901 the number of sheep was 1,683,556, cattle 165,516, and horses 31,607.

At the beginning of 1901 there were 546 miles of railroad in operation. Of these 108 miles were private lines, and the remainder were in the hands of the Government. The imports in 1901 amounted to £1,969,199 and the exports to £2,945,757. The bulk of the trade is with Victoria, Great Britain, and New South Wales. Copper is the most important export, other exports being silver ore, tin, wool, fruit, and potatoes. In 1900 the tonnage of vessels entering Tasmanian ports aggregated 618,963. Hobart and Launceston are the leading ports. Strahan has a large export trade.

There is a Governor appointed by the British Crown, who is assisted by a Cabinet of six responsible members. The Legislature (Parliament) consists of a Legislative Council of 18 elected members and a House of Assembly of 38 elected members. The seat of government is at Hobart.

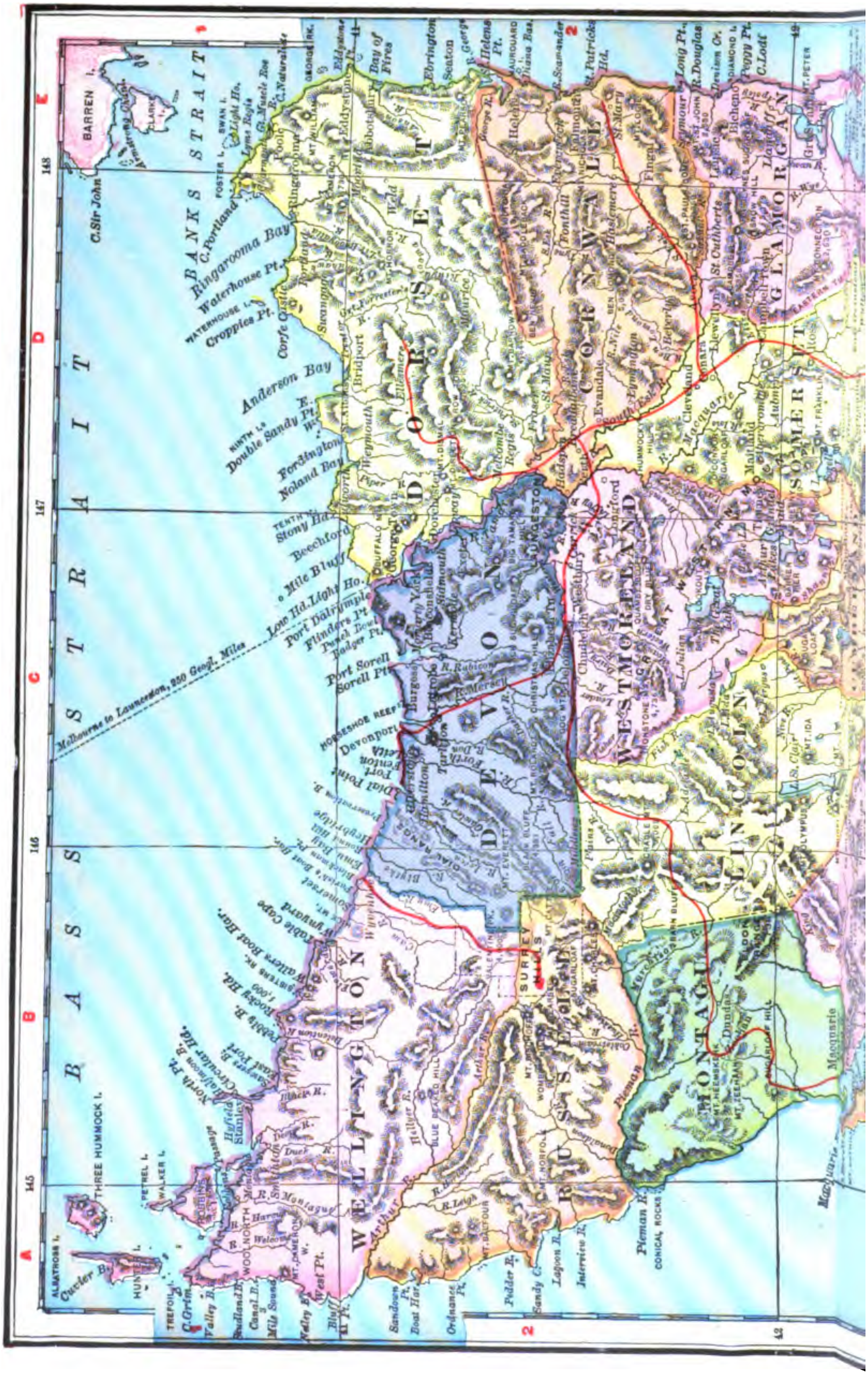
The total receipts from taxation in 1900-01 were £644,510, of which £466,218 were collected from customs duties and the remainder by excise taxes, land taxes, income taxes, etc. The land revenue for the same year was £67,498; the revenue from reproductive public works, £299,468; from other sources, £43,504; making a grand total revenue of £1,054,980. The interest on public debts, £320,151, was the largest item of expenditure. The debt of the State was £8,511,005, of which £7,480,250 was borrowed in London.

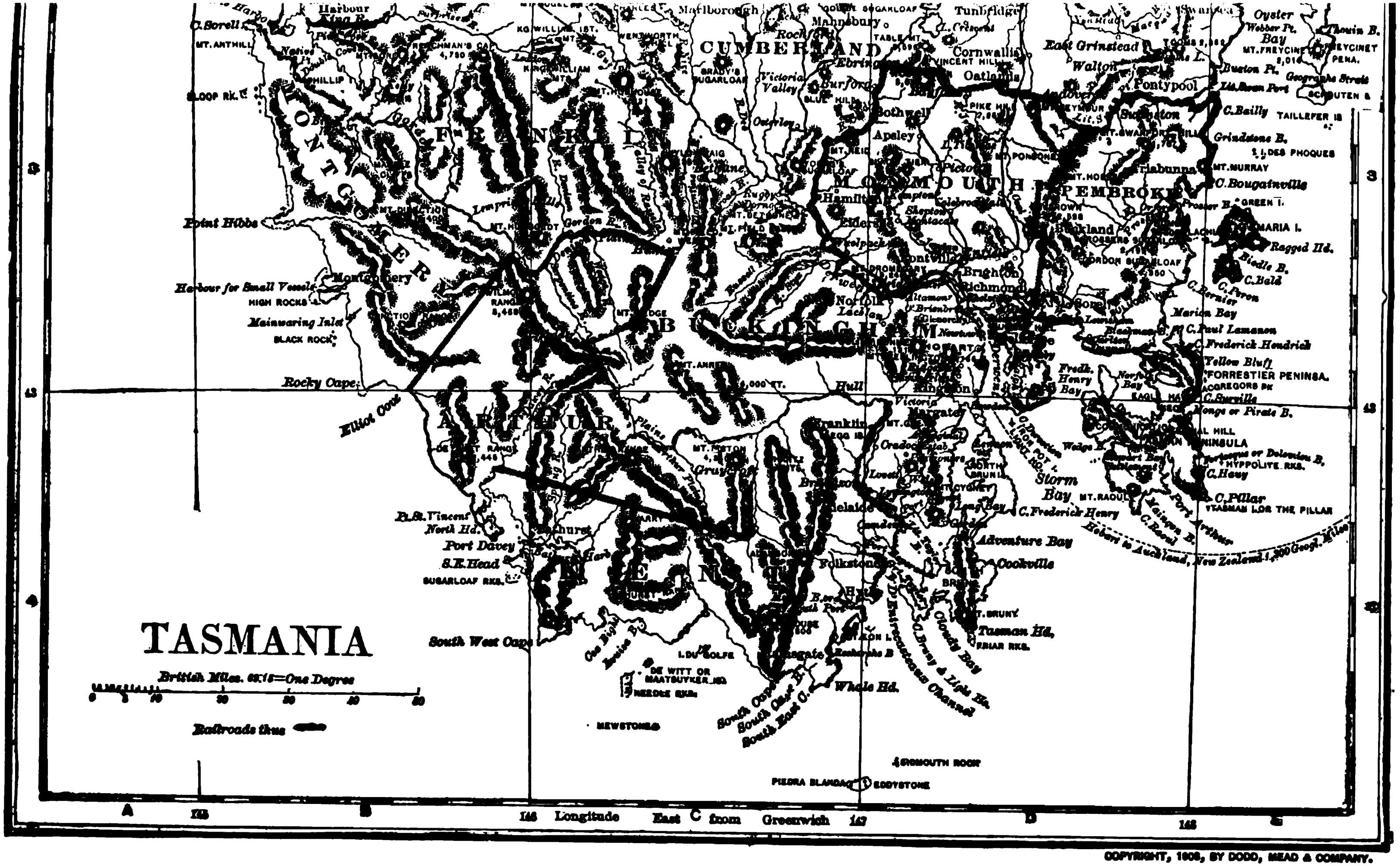
The population increased from 24,279 in 1830 to 145,290 in 1890, and to 182,509 in 1899, and then decreased to 174,233 in 1901. In the latter year there were 89,624 males and 82,851 females. Almost the whole of the population belongs to the British race. In 1900 the emigration was in excess of the immigration. In 1901 the population of Hobart was 31,317; Launceston, 21,046.

In 1901 the members of the Church of England numbered 83,812; Catholics, 30,314; Wesleyans, 24,961; Presbyterians, 11,523; besides these there were a number of minor sects. School attendance is compulsory between the ages of 7 and 13. Small fees are charged. Children who reside far from school are carried free over the State railroads. Religious instruction may be given only after school hours. In 1901 there were 319 primary day schools, with 18,693 in average enrollment, and 14,007 in average attendance. The State extends no aid for secondary education, but there are two State technical schools and a school of mines. The University of Tasmania has its headquarters at Hobart, but gives lectures also at Launceston.

ETHNOLOGY. The aboriginal inhabitants of Tasmania, who are now extinct, were of doubtful racial affinities, having been regarded by different authorities as being variously connected with the Papuan, Melanesian, and Australian races. They were of relatively low stature, with broad, prognathous faces, very flat broad noses, dark skins, and frizzly hair, the last named feature being the chief difference from the Australians. In culture the Tasmanians were probably on approximately the same level as the more primitive tribes of Australian aborigines. The tale of the extermination of the Tasmanians, who never numbered more, perhaps, than five or six thousand, is one of the blackest pages in the history of European colonization. The European settlement began in 1804, and by 1824, when the first census was taken, there were only 340 natives alive. These had dwindled down to four by 1865. The 'last Tasmanian,' a woman named Tinganina, is said to have died in 1876.

HISTORY. In 1642 the Dutch navigator Abel Janszoon Tasman (q.v.) discovered the island now known by his name, supposing it to be the mainland of the southern continent, and called it Van Diemen's Land, in honor of his friend and patron, Anthony Van Diemen, Governor of the Dutch East Indies. It was visited by Captain Cook in 1777. The next recorded exploration is that of George Bass, a young English surgeon, who explored the strait which bears his name in 1798, and thus discovered that Tasmania was not a peninsula, but an island. Later in the year he returned and surveyed the entire coast. No colonizing was attempted until 1803. In that year Captain Collins brought out 400 convicts from England, and in 1804 laid out Hobart Town—so called in honor of Lord Hobart, Secretary of State for the Colonies—the present capital of Tasmania. In the same year


BASS STRAIT
BANKS STRAIT
Melbourne to Launceston, 250 Geogl. Miles
BARREN I.
C.Sir John
Ringarooma Bay
Waterhouse Pt.
Anderson Bay
Double Sandy Pt.
Noland Bay
Stony Hd.
Beechford
Low Hd. Light Ho.
Port Dalrymple
Port Sorell
Devonport
Table Cape
Circular Hd.
THREE HUMMOCK I.
HUNTER I.
C.Grim
West Pt.
Sandy C.
Pieman R.
WELLINGTON
RUSSELL
SURREY HILLS
DEVON
DORSET
CORNWALL
WESTMORELAND
LINCOLN
MONTAGU
SOMERSET
GLAMORGAN
Launceston
Evandale
Longford
Deloraine
Macquarie
Bay of Fires
St. Helens Pt.
St. Patricks Hd.
A
B
C
D
E
145
146
147
148
1
2
41
42



COPYRIGHT, 1908, BY DODD, MEAD & COMPANY.

a settlement was founded in the northern part of the island by colonists from Sydney. In 1806 this colony was transferred to Launceston. From these two centres the colonization of the island proceeded steadily. Till 1823 the island was under the authority of the New South Wales Government. In that year it received a separate Lieutenant-Governor and in 1825 a separate Governor. The opposition to convict labor, always deep-seated, notwithstanding the scarcity of laborers, led, in 1835, to the first petition to the Home Government for its abolition. This, however, did not take place until 1853. In that year, too, the colony received its present name of Tasmania. In 1854 a constitution providing for responsible government by a colonial parliament was framed by the Legislative Council of the colony, in accordance with the terms of the Australian Government Act of 1850, and this bill received the royal assent in 1855. On January 1, 1901, Tasmania became a member of the Commonwealth of Australia.

Bibliography. Just, *The Official Handbook of Tasmania* (Melbourne, 1892); Johnston, *Systematic Account of the Geology of Tasmania* (Hobart, 1888); Murray, *Tasmanian Rivers, Lakes, and Flowers* (London, 1900); Roth and Butler, *The Aborigines of Tasmania* (2d ed., Halifax, 1900); for the flora and fauna, Meredith, *My Bush Friends in Tasmania* (London, 1859); id., *Tasmanian Friends and Foes* (ib., 1880); id., *My Bush Friends in Tasmania. Last Series* (ib., 1891); Fenton, *A History of Tasmania* (Hobart, 1884).

TASMANIAN WOLF, Tiger-Wolf, Zebra-Wolf, or Thylacine. A wolf-like, carnivorous and savage marsupial of Australia. See Dasyure; Colored Plate of Marsupials; Plate of Phalangers.

TAS'MAN SEA. That portion of the South Pacific Ocean which is included between Australia and Tasmania on the west and New Zealand on the east (Map: Australasia, J 6). It is more than 15,000 feet deep, and contains but few islands.

TASSAERT, tȧ'särt, Antoine (1729-88). A Flemish sculptor, born and trained in Antwerp. After working in London and Paris, he was called to Berlin in 1774 by Frederick the Great, who made him Court sculptor and rector of the Academy. He was especially esteemed by Prince Henry, the King's brother, for whose palace he fashioned many statues and groups. His other principal works include the busts of the Great Elector, of Frederick II., and of Moses Mendelssohn, and of later date the statues of generals Seydlitz and Keith, now in the Cadet School at Gross-Lichterfelde.

TASSAERT, Nicolas François Octave (1800-74). A French historical and genre painter. He was born in Paris, and studied at the Ecole des Beaux-Arts and in the ateliers of Girard and Guillon Lethière. In modeling his art upon Chardin and Greuze, he portrayed, with powerful realism and able technique, the sufferings of the poor and the unfortunate. His exaggerated pathos does not appeal to present taste, but he was highly regarded by Delacroix, Rousseau, and other Barbizon masters. After a large historical picture, the "Funeral of Dagobert" (Versailles), came such subjects as the "Death of Héloïse," the "Slave Merchant," "Two Mothers," the "Unhappy Family" (Luxembourg), and the "Old Musician." He asphyxiated himself with the fumes of charcoal.

TAS'SIE, James (1735-99). An English modeler. He was born at Pollokshaws, near Glasgow, and became a stonemason. While working at his trade he studied modeling in Glasgow, and in 1763 went to Dublin, where he entered the laboratory of Henry Quin, a physician who spent his leisure in making imitation gems. Together they invented a kind of vitreous paste, in which they cast wax models of gems and medallions. In 1766 Tassie settled in London, where he continued his work with gems, and also made many casts. The former became very popular, being made with great skill, color, and transparency, and approaching the originals in beauty. His personal collection became famous. At the command of Empress Catharine of Russia he furnished her copies of all his pastes and employed Rudolph Raspe, the creator of Baron Munchausen, to catalogue them. He was associated with Wedgwood in some of his work. He has also considerable claim to remembrance as an original artist, as he made from life many portrait medallions of eminent contemporaries. These works, cast in white enamel, have both charm and verisimilitude. A collection of them is in the Scottish National Portrait Gallery.

TASSO, täs'sô, Bernardo (1493-1569). An Italian poet, born in Venice and educated at Padua. The most part of his life was spent in the service of various ducal and princely rulers, from 1563 in that of Guglielmo Gonzaga, Duke of Mantua, who made him Governor of Ostiglia in 1567. His reputation as a poet rests on the romantic epos *L'Amadigi di Gaula* (1560), based on the Spanish prose version of *Amadis of Gaul*. An episode of it he treated afterwards separately in *Il floridante*, completed by his son Torquato in 1587. His lyrics *Amori* (1555) and *Rime, odi e salmi* (1560) are now forgotten, but his voluminous correspondence, *Lettere* (Padua, 1733-51), is a valuable contribution to the political and literary history of his time.

TASSO, Torquato (1544-95). A famous Italian poet, son of the preceding, born at Sorrento, March 11, 1544. Accompanying his father on his various military and diplomatic missions, he received his early training in Naples, Rome, Urbino, and Venice. Fired by the reports of the inroads made by the Turks in Hungary and by the accounts of their piratical landings on the coast of Italy, the Christian population began to think of a new crusade against the Moslems, and the young Tasso now conceived the idea of writing a poem on the Crusades. He actually did compose on the subject some verses which he revised and incorporated in the first cantos of his *Gerusalemme liberatà*. In 1560 he was sent to the University of Padua to study law, but he soon gave up law for philosophy and letters. He was in the meantime at work upon a poem of chivalrous import, the *Rinaldo* (published at Venice in 1562). From Bologna, where he had been engaged in study for two years, Torquato had to flee in 1564 in order to escape a prosecution for certain satires that he had aimed at professors and fellow students. Induced by the willingness of Cardinal Luigi d'Este to take him into his service, he went to

Ferrara in 1565, and there devoting some attention to his *Gerusalemme*, already begun, he also played a distinguished part at the Court of the Duke, Alfonso II.

Tasso was regularly attached to the suite of Alfonso II. in 1572, and left with full leisure for his literary pursuits, so that in 1573 he was able to compose in a short time his excellent pastoral drama, the *Aminta*, and to continue work upon the *Gerusalemme*, which was finished by 1575. In this same year he was given the sinecure post of historiographer of the Court of Este. Troubles of various kinds now began to affect his mind, and his mental ailment, made worse by a blow on the head received during a quarrel, developed into a mania, which consisted in a belief on his part that he was inclining to heretical principles and was therefore watched and persecuted. In June, 1577, he drew a knife upon a servant who seemed to be watching him as he was conversing with the Princess Lucrezia d'Este, and by order of the Duke he was confined in a room of the palace that he might there receive treatment. Having been later transferred to the Franciscan monastery in Ferrara, he escaped thence one night in July, 1579, and wandered for a while begging his way about Italy, and fleeing in turn from the various asylums offered him. During the lucid intervals of this period he composed several of his best dialogues.

In 1579 he returned to Ferrara, at a time when the attention of the Court was wrapt in the nuptials of the Duke and Margherita Gonzaga. Having failed on this account to obtain the audience that he sought, he became frantic and, bursting into the Court one day, he behaved so violently that it was found necessary to imprison him in the insane asylum of Sant' Anna. He was treated kindly and was allowed to receive the visits of princes, persons of the Court and other friends. At one moment a furious maniac, at the next he was in perfect possession of his faculties and could write his philosophical *Dialoghi*.

As soon as his confinement in Sant' Anna became known, pirated editions of his works began to appear. In 1580 a certain Malaspina published in Venice a garbled edition of fourteen cantos of the *Gerusalemme* under the title *Goffredo*, and this induced a friend of Tasso, Angelo Ingegneri, to publish a more correct edition at Parma and Casalmaggiore (1581). Still better editions are the two that appeared at Ferrara, also in 1581, prepared by still another friend of the poet, Bonnà, who had access to Tasso's own manuscript. But the *Gerusalemme liberata*, thus given to the public in its proper form, no longer pleased its author, who set to work to correct and remodel it, eventually producing the luckless *Gerusalemme conquistata*, a work decidedly inferior to the earlier and inspired epic.

Vincenzo Gonzaga, Prince of Mantua, obtained of the Duke of Ferrara, in 1586, permission to maintain the poet in his own household, and took him away with him. While living with this patron, Tasso completed his tragedy, *Il re Torrismondo* (published at Bergamo, 1587), but his malady regained control of him and, fleeing again, he resumed his wandering life. Having visited Bologna, Naples, Rome, and Florence, he returned to the Court of Mantua in 1591; but toward the end of the year he went again to Rome in company with the Duke, and during the little while he was yet to live he spent his time between Rome and Naples. In 1593 the *Gerusalemme conquistata* was published, and in 1594 Pope Clement VIII. summoned Tasso to the Capitol to be crowned as poet laureate. This ceremony was prevented, however, by the increasing illness of Tasso, who died April 25, 1595. Legendary accounts of the adventures of the unfortunate poet have played a considerable part in the literature of both Italy and other foreign lands, and have afforded themes for the imagination of Goethe, Byron, Lamartine, Espronceda, Leopardi, Prati, and Carducci; but sober historical investigation has made clear that the poet was insane and that Alfonso d'Este was his friend and patron rather than his tyrannical master.

Tasso's prose works embrace his correspondence (*Epistolario*), *Dialoghi* (dialogues on philosophical, moral, literary, and æsthetical subjects), *Orazioni*, *Trattati*, *Discorsi* (these last deal with the nature of heroic poetry, the polemic stirred up by his *Gerusalemme*, etc.). The poetical works include his *Rime* (sonnets, octaves, *canzoni*, etc., some of them love lyrics in the Petrarchian manner, others religious and political in tone); the *Rinaldo* (his early chivalrous poem of twelve cantos in octaves, narrating the adventures of the French hero, Renaut de Montauban, and thus dealing with the Old French legendary matter about Charlemagne and his peers, which had been introduced into Northern Italy at a very early date—to this matter the poet has added a good deal of his own invention); the *Aminta*, the best Italian pastoral drama; the tragedy *Torrismondo* (notable as being one of the first literary attempts in Italy to deal with the Northern Germanic matter that has since been so important in the romantic movement); *Il Monte Oliveto* (a fragment in octaves, celebrating the origin of the congregation of the monks of Mount Olivet); *Le sette giornate del mondo creato* (a philosophical and imaginative account of the creation written in blank verse); *La Gerusalemme liberata* (his masterpiece and one of the greatest glories of Italian literature, singing in twenty cantos of octaves the crusade of Godfrey of Bouillon and developing in connection with it many beautiful love episodes).

BIBLIOGRAPHY. Solerti's ed. of the *Opere minori in versi* (vols. i. and ii., *Poemi minori*, Bologna, 1891; vol. iii., *Teatro*, ib., 1895; vols. iv.-vii., *Rime*) and the eds. of the *Gerusalemme liberata* by S. Ferrari (Florence, 1890) and Solerti (Florence, 1895). Consult: Solerti, *Vita di Torquato Tasso* (Turin, 1895); Ferrazzi, *Torquato Tasso, studi biografici-critici-bibliografici* (Bassano, 1880); Cherbuliez, *Le prince Vital, essai et récit à propos de la folie du Tasse* (Paris, 1864); D'Ovidio, "Il carattere, gli amori e le sventure di Torquato Tasso," in the *Studj critici* (Naples, 1879); Proto, *Sul Rinaldo di Torquato Tasso* (Naples, 1895); Vivaldi, *Sulle fonti della Gerusalemme liberata* (Catanzaro, 1893); Multineddu, *Le fonti della Gerusalemme liberata* (Sassari, 1895); De Grisy, *De T. Tassi Poemate quod Inscribitur Gerusalemme conquistata* (Paris, 1867); Mazzoni, "Della Gerusalemme conquistata," in *In Biblioteca* (Bologna, 1886); Guidi, *Annali delle edizioni e delle ver-*

sioni della Gerusalemme liberata (Bologna, 1868); Solerti, "Bibliografia delle publicazioni tassiane in occasione del terzo centenario," in the *Rivista delle biblioteche e archivi* (1895). Of the English translations of the *Gerusalemme liberata* the most noted is that by Fairfax (London, 1600).

TASSONI, tȧ-sō′nā̇, ALESSANDRO (1565-1635). An Italian diplomat, critic, and poet. He was born in Modena of an old patrician family. About 1595 he published at Rome a dialogue in defense of Alessandro Magno and Obizzo d'Este, an effort which was dedicated to Cardinal Alessandro d'Este, and which attracted such favorable notice from that prelate that young Tassoni was taken into the service of Cardinal Ascanio Colonna (1597). His *Considerazioni sopra le rime del Petrarca* (1609) became the occasion of bitter controversy. In 1613 Tassoni entered the service of Duke Charles Emmanuel of Savoy. But his *Filippiche contra gli Spagnuoli* (1615; reprinted 1855) incurred the displeasure of Cardinal Prince Filiberto of Savoy, and Tassoni withdrew into private life (1622). Afterwards he became secretary to Cardinal Ludovisi, and then councilor and chamberlain at the Court of Duke Francis I. of Modena (1632). The work by which the poet achieved his greatest fame was *La secchia rapita* ("The Stolen Bucket," written 1614; printed in Paris 1622; edited by Carducci 1861, etc.). This is a mock heroic poem in twelve cantos, founded upon an actual incident of the Modenese wars. Precursor of Boileau's *Lutrin* (1673) and Pope's *Rape of the Lock* (1712), it is perhaps the first example of modern humor. Not its entertaining mixture of wit and seriousness alone, but the Tuscan purity of its language and the perfection of its versified form, have made it an Italian classic. A selection of Tassoni's letters was published by Gamba (Venice, 1827), and Casini edited his *Rime* (Bologna, 1880). Consult: D'Ancona and Bacci, *Manuale della letteratura italiana* (Florence, 1893); Muratori, *Vita di Alessandro Tassoni* (Modenese edition of the *Secchia*, 1744); and Bacci, *Le considerazioni sul Petrarca di Alessandro Tassoni* (Florence, 1887).

TASTE (OF. *taster*, Fr. *tâter*, to taste, from Lat. **taxitare*, frequentative of *taxare*, to touch, intensive of *tangere*, to touch; connected with Goth. *têkan*, Icel. *taka*, AS. *tacan*, Eng. *take*). The tongue is supplied with nerve endings which not only (like those of the skin) mediate sensations of pressure, temperature, and pain, but also furnish sensations of taste. The nerve endings concerned in gustatory sensation are the taste bulbs or beakers, many of which are clustered together in the sides of each circumvallate and fungiform papilla (the filiform papillæ are insensitive to taste). Taste sensations enter consciousness highly fused with pressure, temperature, and notably with smell sensations; e.g. the flavor of wine is largely smell. Hence it is not strange that the number of elementary taste qualities has but recently been determined. Linnæus gave a list of 20 qualities; another early writer 10; modern methods have lowered the number to 4: sweet, bitter, sour, and salt, to which Wundt adds, doubtfully, alkaline and metallic. See TONGUE and accompanying illustrations.

If the tongue be experimentally explored by stimulating individual papillæ with four solutions (usually sugar, quinine, tartaric acid, and salt), it will be discovered that most papillæ are selective; e.g. one may react only to sweet, another only to salt and sour, a third to sweet, salt, and sour, etc. That such differences should appear is but natural, for each papilla is, in reality, a cluster of taste cells. Now it is possible so to treat a papilla which has yielded more than one taste as to destroy temporarily its reaction to one of these tastes without destroying its sensitivity to the others; thus a 20 per cent. solution of cocaine hydrochlorate will eliminate bitter alone. From these facts, it is warrantable to assume that the doctrine of specific sense energies applies to the tongue. The recent work of Kiesow and Nadoleczny (stimulating the chorda tympani at a point near the internal ear) seems to establish the possibility of inducing specific taste sensations by inadequate electrical stimulation; pressure yields more doubtful results.

Kiesow has shown that the tongue is not equally sensitive over all its surface; the tip is best for sweet, the base for bitter (pressure here seems at times to arouse bitter), the sides for sour. Sensitivity to salt is about equal over all the surface. Recent experimentation has established beyond much doubt the existence of *taste contrasts*, both simultaneous and successive. The contrasting pairs are sweet-salt, sweet-sour, salt-sour: bitter does not contrast with any taste. The stimulation of the tongue by one member of these pairs increases its sensitivity to the other member, or causes distilled water to give the contrasting taste. As in the cases of vision and smell (qq.v.), taste contrasts imply *taste compensations*. A mixture of sugar and salt in proper proportions is insipid. From these facts, Kiesow has constructed a two-dimensional taste continuum—a square whose opposite corners are sweet and salt, bitter and sour. Mixtures of adjacent terms will, then, give an intermediate, mixtures of opposite terms, an insipid taste.

BIBLIOGRAPHY. Kuelpe, *Outlines of Psychology* (London, 1895); Hofman and Bunzel, *Pflüger's Archiv*, lxvi. (1897); Kiesow and Nadoleczny, *Zeitschrift für Psychologie und Physiologie*, xxiii. (1900); Kiesow, *Philosophische Studien*, x. (1894), xii. (1896); Titchener, *Experimental Psychology* (New York, 1901); Vintschgau, in *Hermann's Handbuch der Physiologie*, iii. (1880); Zeyneck, *Centralblatt für Physiologie*, xii. (1898).

TATAR BAZARJIK, tȧ-tär′ bä′zȧr-jĕk′, or PAZARJIK. A district town in Eastern Rumelia, Bulgaria, situated on the Maritza, 74 miles southeast of Sofia (Map: Balkan Peninsula, E 3). It lies in a low region and suffers from inundations. Population, in 1892, 16,343, mainly Bulgarians. The place was founded by Tatars in the fifteenth century.

TATARS (less correctly *Tartars*, Fr. *Tartare*, from ML. *Tartarus*, from Pers. *Tātar*, Chin. *Tah-tar*, *Tah-dzŭ*, Tatar, possibly from a Tungusic or Manchu word meaning archer, nomad; probably confused by popular etymology with Lat. *Tartarus*, hell, on account of their atrocities). A term loosely applied to certain Tungusic tribes originally inhabiting Manchuria and Mongolia, and now represented by the Fishshin Tatars of Northern Manchuria, the Solons and Daurians of Northeastern Mongolia, and the Manchus of China. In the course of the westward movement of the Mongols the term Tartar obtained vogue among the civilized peoples of Western Asia and Eastern Europe, and came to be applied with little discrimination to the hordes of Mongols who descended from time to time upon the frontiers of Occidental civilization and to the kindred peoples subdued by them. Ultimately it came to be used almost, if not quite, as a synonym for Turkish (Tûrki), in which sense it is still employed by some modern ethnologists.

The 'Tatars of Siberia' (Baraba, Irtish, Tobol, etc.) are probably of very mixed origin. In Western Siberia some fragments of the Ostiaks, etc., have been styled Tatars, probably from their adoption of Tatar customs, etc. The Tatars of European Russia are of diverse origins. The so-called Kazan and Astrakhan Tatars are fragments of the Golden Horde. The Tatars of the Crimea are probably composed of the Nogai-Tatars of the steppes and the Tatars of the mountains and coast regions. There are besides the Tatars of the Caucasus. It will easily be seen that most of these peoples styled Tatars are, linguistically at least, of Turkic stock, but very mixed physically. Consult: Wolff, *Geschichte der Mongolen oder Tartaren* (Breslau, 1872); Howorth, *History of the Mongols* (London, 1876-80); Vámbéry, *Etymologisches Wörterbuch der turko-tatarischen Sprachen* (Leipzig, 1878); id., *Die primitive Cultur des turko-tatarischen Volkes* (ib., 1879); De Harlez, *La religion nationale des Tartares orientaux* (Brussels, 1887); Chantre, *Recherches anthropologiques dans le Caucase* (Paris, 1885-87).

TATE, Sir HENRY (1819-99). An English philanthropist and art patron. He was born at Chorley, Lancashire; entered early on a commercial career in Liverpool, and in 1874 went to London, where he acquired a large fortune in sugar-refining. His chief claim to distinction is as founder of the National Gallery of British Art, popularly known as the Tate Gallery, on the Thames Embankment, near Vauxhall Bridge. This originated in his private collection of modern British pictures. His desire to have this collection preserved prompted his offer of $240,000 for a building purely devoted to British art, if the Government would provide the site. The building was completed and opened in 1897.

TATE, NAHUM (1652-1715). An English poetaster, born in Dublin. He graduated at Trinity College, Dublin, in 1672, and five years later he was settled in London. In 1692 he succeeded Shadwell as poet laureate. With the exception of Pye (q.v.), he is the tamest of the laureates. He passed his last days in the Mint in Southwark, then a privileged sanctuary for debtors. Tate composed several plays and much poor verse, including elegies and birthday odes. His best poem, composed independently, is *Panacea, or a Poem on Tea* (1700). With some success he wrote a second part to Dryden's *Absalom and Achitophel* (1682). The best passages, however, were by Dryden. In literary history Tate has gained unenvied fame as an adapter of several plays by Shakespeare and other Elizabethans. Among them are *Richard II.* (1681), *King Lear* (1681), and *Coriolanus* (1682). His version of *Lear*, in which Cordelia survives and marries Edgar, held the stage till 1840. Tate is also known as the joint author, with Nicholas Brady, of the *New Version of the Psalms* (1696; supplement 1698). To Tate is ascribed the beautiful Christmas hymn "While Shepherds Watched."

TATE, RALPH (1840-92). An English geologist and paleontologist, born at Tenwick. He was educated at the Cheltenham Training College and Royal School of Mines. In 1861 he entered the Philosophical Institution of Belfast as a teacher of natural sciences, and during the following years devoted himself to the study and description of the Liassic fossils of Ireland. In 1867 he joined an expedition for the exploration of Nicaragua and Venezuela, and upon his return to England published a series of papers on the geology and paleontology of those countries. He received an appointment as professor of natural sciences at Adelaide, South Australia, in 1875, where he passed the remainder of his life. He established the Royal Society of South Australia, and was otherwise active in the formation of geological science. The list of his publications includes several hundred papers and monographs.

TATIAN, tā′sh*a*n. A Christian apologist of the second century. He was a native of Assyria, received a Greek education, and came to Rome in the time of Justin Martyr, with whom he was intimately associated, probably about the year 152. Under the instruction of this first Christian philosopher, Tatian early became a Christian, and wrote thereupon his first important work, *The Address to the Greeks.* After Justin's death he turned toward views which caused him to be identified with the Gnostics, although comparison of the different accounts leads to the suspicion that party spirit may have exaggerated his departure from the commonly received Christian doctrines and practices. Tatian returned to Mesopotamia, where he was welcomed heartily and performed valuable services for the Church. He prepared here a harmony of the Gospels in Syriac, under the name of *Diatessaron*, or *The Fourfold Gospel*, which early attained a wide circulation among the Syriac-speaking churches, and was made the subject of a commentary by Ephrem Syrus. The Syriac original cannot have been prepared long after Justin's death (about 166), and therefore gives important testimony to the general acceptance of the Fourth Gospel at that time, and hence to its considerably earlier origin. The *Diatessaron* has accordingly been an object of great interest, but the text has been until recently regarded as hopelessly lost. In 1883 a description of an Arabic translation of the *Diatessaron* existing in the Vatican Library, previously but imperfectly described by others, was put forth by Ciasca, a 'scriptor' in that library, and in 1888 he published an edition of the text with a Latin translation. A second manuscript of the same translation had meantime been presented to the library (1886). This Latin version has been translated into English by Hill (Edinburgh, 1894), and an English translation from the Arabic has been made by Hogg (ib., 1897). Consult: Zahn, *Forschungen zur Geschichte des neutestamentliche Kanons*, vol. iv. (Erlangen, 1891); Harris, *The Diatessaron of Tatian* (London, 1890); id., *Fragments of the Commentary of Ephrem Syrus on the Diatessaron* (ib., 1895).

Both the extant works of Tatian may be found in translation in the *Ante-Nicene Fathers*, vols. ii. and iv. (New York, 1885 et seq.).

TATISHTCHEFF, tȧ-tĭsh'chef, VASSILI NIKITITCH (1686-1750). A Russian historian, born in the Government of Pskov. He was educated in the Moscow School of Artillery and Engineering and in Germany. For many years he was superintendent of the mines of the Ural region, and Governor of Astrakhan. He wrote a valuable *History of Russia*. His *Testament* (1775) is a didactic work addressed to his son.

TATIUS, tä'shĭ-ŭs, ACHILLES. A Greek writer. See ACHILLES TATIUS.

TATLER, THE. A penny paper published at London by Sir Richard Steele, issued three times a week and running through 271 numbers, between April 12, 1709, and January 2, 1711. Its original purpose was merely to describe events of the day; but with the contributions of Addison, which began in number 18, it gradually assumed a more didactic tone and eventually became a set of essays on various social and quasi-political topics. Its sudden withdrawal was probably occasioned by the exception taken by Steele's superiors in Government offices to certain statements printed in it and the editor's consequent dismissal from the gazetteership. His pseudonym of Bickerstaffe had also by this time been penetrated. Steele wrote 188 of the papers and Addison 41. The remainder were mostly written by both in collaboration. The successor of the *Tatler* was the *Spectator* (q.v.).

TAT'NALL, JOSIAH (1795-1871). An American naval officer, born at Bonaventure, near Savannah, Ga. He was educated in England, and entered the United States Navy in 1812. He served with Decatur in the Algerine War, became a lieutenant in 1818, had charge in 1829 of the surveys of the Tortugas reefs, received command of the mosquito division in the Mexican War, participated in the capture of Vera Cruz, and led the attack upon the forts at Tuxpan, where he was wounded. In 1850 he was promoted to a captaincy, and in 1857 became flag-officer on the Asiatic station. In June, 1859, he actively aided the British gunboats accompanying the British envoy sent to Peking to exchange ratifications of the treaty made in the preceding year, and helped to tow the British marines to a point whence they attempted to storm the Taku forts. During a visit made by Tatnall to the British flagship for the purpose of offering the services of American surgeons, some of the men who had accompanied him served, without his knowledge at the time, one of the forward guns of the British flagship. In extenuation of this technical violation of international law he declared that "Blood is thicker than water;" and his action was sustained both by public opinion and the Government. On the outbreak of the Civil War in 1861, he resigned and became a captain in the Confederate Navy, charged with the defense of Georgia and South Carolina. In March, 1862, he was given command of the *Merrimac* (*Virginia*), and the defenses of Virginia; destroyed this vessel in order to escape capture; was later court-martialed for this, but was acquitted; was unsuccessful in his defense of Savannah, and was in January, 1865, obliged to destroy his fleet. He was included in Johnston's surrender to Sherman, was paroled, and in 1866 removed with his family to Halifax, but returned in 1870 and was inspector of the port of Savannah until his death. Consult the *Life of Commodore Tatnall*, by C. C. Jones and Tatnall's son, J. R. F. Tatnall (Savannah, 1878).

TÁTRAFÜRED, tä'trȧ-fụ'rĕd (Ger. *Schmeks*). A noted Hungarian watering-place and health resort in the county of Zips, situated in the midst of pine forests on the southern slope of the Hohe Tâtra, at the foot of the Schlagendorf peak at an elevation of 3340 feet above the sea. It has mineral springs, pine-cone baths, and a cold-water cure. Near by are the health resorts of Uj Tâtrafüred (Neuschmeks) and Alsó Tâtrafüred (Lower Schmeks).

TÁTRA (tä'trŏ) **MOUNTAINS.** See CARPATHIAN MOUNTAINS.

TATS, täts. An agricultural people of extreme Western Persia and the Caspian region of the Caucasus. Although they may possess some Mongolian blood, they are not Tatars either somatically or linguistically. Some authorities class them with the Persian Tajiks (q.v.). They are closely related to the Gurans. The Caspian Tats number between 30,000 and 40,000. Their language is a dialect of Persian.

TA TS'ING, tä'tsĭng' (or CH'ING). The dynasty on the throne of China at the opening of the twentieth century. It is of Manchu origin and begins with the year 1644. The name—*Ts'ing*—means 'pure' or 'purity,' and is said to be synonymous with the word *Manchu*. *Ta* means 'great' and is prefixed to almost all dynastic names. It is to be remembered that the personal name of a Chinese Emperor is never used during his lifetime. When he comes to the throne a name for the period of years during which he reigns is chosen; but it is convenient at times to transfer this name to the man himself; hence we sometimes speak of the Emperor K'ang-hi, or the Emperor K'ien-lung, though strictly speaking these names denote only certain periods of years. After death a 'temple-name' is chosen for each, and this is the name by which he is spoken of in history.

THE REIGN-PERIODS OF THE TA TS'ING CH'AO OR 'GREAT PURE' DYNASTY OF CHINA

NAME OF REIGN	Began	Ended
1. Shun-chih	1644	1661
2. K'ang-hi or K'ang-hsi	1662	1722
3. Yung-ching, or Yung-chêng	1723	1735
4. K'ien-lung or Ch'ien-lung	1736	1795
5. K'ia-K'ing or Chia-ch'ing	1796	1820
6. Tao-Kwang	1821	1850
7. Hien-fung or Hsien-fêng	1851	1861
8. T'ung-chih	1862	1874
9. Kwang-sü or Kwang-hsü	1875	......

TAT'TAM, HENRY (1788-1868). A distinguished Coptic scholar. He was born in Ireland and was educated at Trinity College, Dublin, and at Göttingen and Leyden; he was ordained in the Church of England; and was rector of Saint Cuthbert's, Bedford, 1818-45; archdeacon of Bedford, 1844; and rector of Stamford Rivers, Essex, 1849. He traveled in the East and became distinguished as an Orientalist, in which department he published various works. Among the ancient Syriac manuscripts which he found at a convent in Egypt were the *Ecclesiastical History* of John, Bishop of Ephesus, and the

Epistles of Ignatius. He published a Coptic grammar (1830, 2d ed. 1863), and a dictionary (1835), besides versions of the prophets (1836-52) and of the *Apostolical Constitutions* (1849) in that language.

TAT'TERSALL'S. A famous English market for riding and carriage horses, situated in Grosvenor Place, London. It was established about 1780 by Richard Tattersall, a groom to the Duke of Kingston. It consists of a large and handsome building in the centre of which is a large court under a glass roof. It is the centre of all business relating to horse-racing and betting throughout the country.

TATTLE. A vicious and hypocritical fop in Congreve's *Love for Love*, who boasts that he never "kisses and tells;" but he is not above a free discussion of his love affairs. He is smitten with the charms of Angelica, but is gulled into marriage with an aged coquette, Mrs. Frail. The character may have been an elaboration of Malagene in Otway's *Friendship in Fashion.*

TATTOOING (from *tattoo,* from Tahitian *tatu,* tattooing, tattooed). The practice of decorating the surface of the body by introducing pigments under the skin. The process consists in pricking the skin with a sharp instrument and inserting the pigments, usually powdered charcoal, in the punctures. The design appears in a deep blue color and is indelible. In the modern development of the custom other pigments have come into use.

As a primitive mode of ornamentation, tattooing is very widespread, its distribution as compared with the related custom of scarification being determined by the color of the skin. In general, light-skinned races tattoo, while dark-skinned peoples practice scarring.

The original significance of tattooing is disputed. It has been held by some authorities that it had a religious or social meaning, but the best evidence goes to show that it was at first purely ornamental in character. It must indeed be admitted that in many instances the tattooed designs have a tribal or clan or even a religious meaning, but this usage is probably a derivative of the decorative.

The patterns range from simple lines and dots to complex designs. Probably the highest development of the custom among primitive peoples is in New Zealand, though it is also much practiced in various parts of the East Indian archipelago and in Polynesia. The tattooing of the natives in North and South America and in parts of the world other than those mentioned above is, as a rule, of simple character. In modern times and among higher races the Japanese have brought the art to its highest state of perfection. The prevalence of the practice among sailors of all nationalities is well known, but in both these cases the patterns in use have entirely lost their primitive characteristics and are of civilized origin. Consult Lacassagne, *Les tatouages* (Paris, 1881); Joest, *Tätowieren, Narbenzeichnen und Körperbemalen* (Berlin, 1887).

TAUBERT, tou'bĕrt, Wilhelm (1811-91). A German pianist and composer, born in Berlin. He studied philosophy at the university there, at the same time studying composition under Berger and Klein, and afterwards taught music until 1831, when he became conductor of the Court concerts. In 1841 he was appointed conductor of the royal opera. He was a member of the Academy of Arts from 1839 and president of the musical section of the same from 1882. His works include the operas: *Die Kirmes* (1832), *Macbeth* (1857), *Cesario* (1874), music for the *Medea* of Euripides, and Shakespeare's *Tempest.* His songs were popularized by Jenny Lind and other noted singers.

TAUCHNITZ, touk'nĭts, Christian Bernhard, Baron (1816-95). A German publisher, born near Naumburg, a nephew of the following. His firm, founded in Leipzig (1837), was noted for its accurate classical and biblical texts, its dictionaries, and other works of reference. In 1841 Tauchnitz began a *Collection of British Authors,* now extending to some 3500 volumes and widely read on the Continent. English authors were paid a royalty by Tauchnitz, who thus helped to establish the present international copyright law. A similar collection of translated *German Authors* was begun in 1866 and *Students' Tauchnitz Editions* of English and American works began to appear in 1886 with German notes and introductions. Tauchnitz was made Baron in 1860, British Consul General for Saxony in 1872, and member of the Saxon House of Peers in 1877.

TAUCHNITZ, Karl Christoph Traugott (1761-1834). A German publisher, born in Grosspardau. He began to print books in 1797 at Leipzig. He was the first to use stereotype plates (1816) in Germany. His stereotyped editions of the classics were once widely famed alike for their cheapness, their convenience, and their accuracy. He thus printed a Bible in Hebrew and the Koran in Arabic. By his will Leipzig received 4,500,000 marks for charitable ends. The business was continued by his son Karl Christian (1798-1884).

TAUERN, tou'ĕrn. A division of the Eastern Alps, including the principal section of what was known to the ancients as the Noric Alps (Map: Austria, D 3). It lies between the rivers Drave and Mur on the south and the Enns on the north, and extends from the eastern part of Tyrol through the Austrian crownlands of Salzburg and Carinthia into the northern part of Styria. The system consists of two main divisions, the Hohe (high) Tauern in the west, and the Niedere (low) Tauern in the east. The whole system has a length of about 150 miles and a width of 28 miles. It is wholly of Archæan formation, consisting chiefly of gneiss in the west and mica-slate in the east, with some granite. The western or Hohe Tauern, as their name implies, are considerably higher and more rugged than the eastern. Their main range forms a sharp ridge with steep sides rising above the snow line and carrying over 250 glaciers, from which numerous mountain torrents fall in cataracts down the steep valleys. The highest peak in the system is the Grossglockner, with an altitude of 12,461 feet.

TAULER, tou'lĕr, Johann (1300-61). A German mystic. He was born at Strassburg and when fifteen years old entered the Order of the Dominicans. When the 'black death' visited Strassburg in 1346, he stuck to his post and comforted the people. Excepting preaching tours into the Rhineland, he remained in Strassburg until his death. Tauler was an emotional yet practical mystic and left a large number of sermons full of evangelistic life. He preached in German and wrote *The Book of Spiritual Poverty*, which, as well as many of his sermons, was translated by Susanna Winkworth, but not literally. Of the various editions of Tauler's works, the Frankfort edition of 1826 is the most complete. Consult: Schmidt, *Johannes Tauler* (Hamburg, 1841); id., *Nicolas von Basel, Bericht von der Bekehrung Taulers* (Strassburg, 1875); Preger, *Geschichte der deutschen Mystik*, vol. iii. (Leipzig, 1893); Susanna Winkworth, *Tauler's Life and Times* (London, 1857).

TAUNTON, tän'ton. The capital of Somersetshire, England, in the valley of the Tone, 38 miles southwest of Bristol (Map: England, C 5). The streets are wide and are well paved. The Church of Saint Mary is of Perpendicular architecture, and is famous for its ornamented tower; that of Saint James was the conventual church of Taunton priory. Taunton is the headquarters of the Somerset Archæological and Natural History Society and has an extensive museum in the remains of the Norman castle. It owns the water and electric lighting plants, and sewage works, and maintains parks, pleasure and recreation grounds. It has manufactures of silk and hosiery. Ina, King of the West Saxons, built a castle in Taunton about A.D. 700. This was soon after destroyed, but another fortress was built on the site soon after the Conquest, at which period the town had a mint. Population, in 1891, 18,961; in 1901, 21,078. Consult Toulmin, *History of Taunton* (Taunton, 1822).

TAUNTON. One of the county-seats of Bristol County, Mass., 36 miles south of Boston; on Taunton River, and on the New York, New Haven and Hartford Railroad (Map: Massachusetts, E 4). It is regularly laid out with finely shaded streets, and has many handsome residences. Among its institutions are the State Insane Asylum, Morton Hospital, the Old Ladies' Home, and Bristol Academy. The Public Library contains 47,000 volumes. Other important collections are the Bristol County Law Library and that of the Old Colony Historical Society. The city hall, county court house, the post-office, and the jail are buildings of merit. There are several pleasure grounds, of which Taunton Green and Woodward Springs Park are the more noteworthy. The Bristol County Agricultural Society has extensive grounds and buildings here.

Taunton carries on a large trade, being the business centre of a number of towns in the vicinity. It has also important industrial interests, the various establishments in the census year 1900 having $11,737,399 capital, and an output valued at $12,594,814. The principal manufactures are cotton goods and silverware. There are stove foundries, locomotive works, wood-working establishments, and manufactories of copper ware, tacks, wire nails, stove lining, carriages, buttons, boxes, oilcloth, brick, etc. Herring fishing is another industry of considerable importance.

The government, under the charter of 1882, is vested in a mayor, chosen annually, and a bicameral council, and in subordinate officials, the majority of whom are elected by the council. The school committee, however, is chosen by popular vote. For maintenance and operation, the city spends annually about $462,000, the principal items being: schools, $116,000; interest on debt, $81,000; streets, $41,000; police department, $40,000; charities, $33,000; and fire department, $27,000. The water-works, which represent an expenditure of $1,288,129, and the electric light plant, are owned by the municipality. Population, in 1890, 25,448; in 1900, 31,036.

Settled in 1638 as Cohannat, Taunton was incorporated under its present name in 1639. It was made a shire town in 1746 and was chartered as a city in 1865. The first permanent settlement in Vermont was made by a company from Taunton in 1736. Consult: *Quarter-Millennial Celebration of the City of Taunton* (Taunton, 1889); Emery, *History of Taunton* (Syracuse, 1893).

TAUNUS, tou'nụs. A mountain range of Western Germany, in the Prussian Province of Hesse-Nassau, extending about 55 miles in a northeast direction from the right bank of the Rhine near its confluence with the Main. It consists mainly of schists and quartzites, and reaches its highest elevation, 2713 feet, in the northeast. It is steepest, however, in the southwest, where it falls into the Rhine in precipitous crags crowned with ruined castles. The higher portions of the range are forest-clad, and the lower slopes are covered with vineyards yielding some of the best of Rhenish wines. The range is also famous for its numerous mineral springs, including those of Wiesbaden.

TAURIDA, tou'rī-dȧ. A government of European Russia, consisting of the peninsula of the Crimea (q.v.) and a portion on the mainland connected with the peninsula by the Isthmus of Perekop (Map: Russia, D 5). Area, about 24,530 square miles. The region north of the isthmus is mostly flat and its climate is considerably colder than that of the peninsula. The principal river of the mainland portion is the Dnieper, which forms its northwest boundary. This part of the government is well adapted by its steppe-like surface for stock-raising. Large numbers of merino sheep are reared. Wheat, rye, barley, and oats are produced extensively. The cultivation of industrial plants and fruits is confined principally to the peninsula. The chief manufactures are flour, tobacco, and some iron products. Population, in 1897, 1,443,566, of whom the Russians constituted about 71 per cent. and the Tatars over 12 per cent. The capital is Simferopol. See CRIMEA.

TAURIN (from Lat. *taurus*, bull, so called because first discovered in the bile of the ox), or AMIDO-ETHYL-SULPHONIC ACID, $C_2H_4(NH_2)SO_3H$. A remarkable substance occurring, as a constituent of tauro-cholic acid, in the bile and in other animal products and tissues. In a state of purity it forms six-sided glistening prisms, which are perfectly transparent, neutral, devoid of odor, readily soluble in water, but insoluble in alcohol and ether.

TAU'RUS. A mountain range in the southern part of Asia Minor forming the southern boundary of the Anatolian Plateau, which covers the central part of the peninsula (Map: Turkey in Asia, E 4). It follows the Mediterranean coast from the Euphrates toward the Ægean Sea. On the north it slopes gradually toward the plateau, but on the south it falls in steep terraces toward the sea. The Taurus rises to a height of 7000 to 10,000 feet, being highest near the eastern end. It is broken by a number of river valleys, the principal being that of the Sihun, which separates from the main range a northeastern extension known as the Anti-Taurus.

TAUSIG, tou′sĭk, Karl (1841-71). A German pianoforte virtuoso, born in Warsaw. He became famous for technique and interpretative ability, and won a world-wide reputation by the concert tours that occupied his short life. He was connected with the musical life of Dresden (1859-60), Vienna (1862), and Berlin (1865), in which latter city he founded a 'Schule des höheren Clavierspiels,' which he gave up in 1870. Of his composition and arrangements the great proportion are classical pianoforte works which he edited. He also prepared and edited a new edition of Clementi's *Gradus ad Parnassum*, and arranged the piano score of Wagner's *Meistersinger*. He composed and published two *Etudes de concert* (F♯ and A♭), also *Ungarische Zigeunerweisen*, *Nouvelles soirées de Vienne*, and *Valses-Caprices* on themes from Strauss.

TAUS′SIG, Frank William (1859—). An American political economist, born in Saint Louis, Mo. He graduated at Harvard in 1879, and became full professor of economics there in 1892. His publications include: *The Tariff History of the United States* (1888; 4th ed. 1898), a standard work on the subject; a *History of the Present Tariff, 1860-83* (1885), and *Protection to Young Industries as Applied to the United States* (1883), in the "Questions of the Day Series;" *The Silver Situation in the United States* (1892); and *Wages and Capital* (1896). He also edited *State Papers and Speeches on the Tariff* (1892); and for some years was editor-in-chief of the *Quarterly Journal of Economics*.

TAUTENHAYN, tou′ten-hīn, Joseph (1837-—). An Austrian medalist and sculptor, born in Vienna, where he studied at the academy (1854-60) under Radnitzky (1818-1901) and sculpture under Franz Bauer (1798-1872), then in the engravers' academy of the Imperial mint. After his return from a study trip through Italy, France, and England, undertaken in 1869-72, he was appointed Imperial engraver of coins and medals, and in 1881 professor at the academy. Among a large number of choice medals those commemorating the Coronation of Francis Joseph as King of Hungary (1867), the Imperial Silver Wedding (1879), and the Bicentennial of the Relief of Vienna from the Turks (1883), are the most noteworthy. His plastic work on a large scale includes a group of the "Birth of Athens," and statues for the university, also statues for the Art-Historical Museum and the Houses of Parliament.

TAUTOG (Massachusetts Indian *tautauog*, pl. of *taut*, sheep's head, the Indian name of the fish). An American food-fish (*Tautoga onitis*) of the family (Labridæ) to which the wrasses of Europe belong. It is found from Maine to South Carolina, especially along the coast of Southern New England, on rocky and weedy bottoms, where it lives on mollusks, crustaceans, worms, sand-dollars, etc. It is abundant, is of considerable importance as a food-fish, and is locally known as 'blackfish' and 'oyster-fish.' It may attain an extreme weight of 22 pounds, with a length of three feet, but the average weight is about three pounds. The annual catch amounts to about 1,500,000 pounds, valued at $60,000. The tautogs spawn in May and June, and are very prolific, a large fish yielding more than a million eggs, which are small and buoyant, and hatch in four or five days. Consult Goode, *Fishery Industries*, sec. i. (Washington, 1884).

TAV′ERNER, Richard (c.1505-75). An English religious writer. He was born at Brisley, Norfolk; graduated at Oxford in 1529; was clerk of the signet under Thomas Cromwell, and managed to retain Court favor after Cromwell's fall (1540). In 1545 he was returned to Parliament, and by the King's gift came into possession of much property. Under Edward VI. he maintained his position. Early won for the Reformation and the author of a translation of the Augsburg Confession (1536) and other original and translated works in the interest of Protestantism, and a licensed lay preacher under Edward VI., he still was unmolested by Mary, although he lost his office. Under Elizabeth he came again into royal favor and was high sheriff of Oxford (1569). Taverner's principal literary work was a revision of Thomas Matthew's Bible of 1537, upon the suggestion of Thomas Cromwell. Some of the happiest renderings, as 'parable' for 'similitude,' 'the love of many shall wax cold,' 'the Israel of God,' in the current version are due to Taverner. It was the first complete Bible ever printed in England (London, 1539).

TAVERNIER, tȧ′vȧr′nyȧ′, Jean Baptiste, Baron d'Aubonne (1605-c.89). A French traveler, born in Paris. He became a dealer in precious stones, and between 1638 and 1663 made a number of journeys to Persia, China, India, and the East Indies. His *Voyages en Turquie, en Perse, et aux Indes*, edited by Chappuzeau and La Chapelle, went through several editions, of which the best is that of 1679.

TAVIRA, tȧ-vē′rȧ. A seaport town of the Province of Algarve, Portugal, 136 miles southeast of Lisbon, on both sides of the river Gilão, at its mouth (Map: Portugal, B 4). The harbor is navigable for small vessels and affords an important commerce in mineral waters and white wines. The town is of much less importance than during the Middle Ages. Population, in 1900, 12,178.

TAV′ISTOCK. A market-town in Devonshire, England, picturesquely situated on the western border of Dartmoor, about 35 miles southwest of Exeter, and 12 miles north of Plymouth, in the fertile valley of the Tavy, which is crossed by two bridges within the town. There are iron foundries and mining works, copper, lead, tin, and iron being found in considerable quantity in the neighborhood. The parish church, dating from 1318, is a handsome edifice. Tavistock was formerly of great importance, owing to its abbey, the largest and most magnificent in Devonshire, which was founded in the year 961, for the Benedictine Order. The refectory and abbey gateway still exist. Population, in 1901, 5013.

TAVOY, tȧ-voi′. The capital of a district of the same name in Tenasserim, Lower Burma, 160 miles west by north of Bangkok, on the Tavoy River, 30 miles from its mouth (Map: Burma, C 4). It is the shipping point for the rice and fruit of the surrounding region, and manufactures earthenware and salt. Tavoy has been a British possession since 1824. Population, in 1901, 22,371.

TAVRIS, tȧ-vrēs′. A town of Persia. See Tabriz.

TAWING. See Leather.

TAWNY, or **TENNE.** The term for orange color in heraldry (q.v.).

TAX (OF., Fr. *taxe*, from ML. *taxa*, *tasca*, taxation, tax, from Lat. *taxare*, to touch, rate, appraise, estimate), and Taxation. A tax is a compulsory contribution from private income or wealth to meet the general expenses of government. The purpose of taxation is primarily the securing of revenue, although it may incidentally subserve political, social, or moral ends. The common element in all forms of taxation is the destination of the revenue derived from them—to cover general expenses of government. This characteristic serves to distinguish from taxes such compulsory payments as fees and special assessments (q.v.), which are primarily payments to meet costs incurred in affording special public services to the individuals who pay them.

Taxation, while it is to-day by far the most important source of public revenue, is of comparatively recent origin. The mediæval State depended for its revenues largely upon the product of the public domain. (See Finance.) It was in the cities that taxation first developed. Payment of taxes was generally regarded as prerequisite to citizenship. With the increase in public needs which accompanied the development of the national State, various forms of indirect taxes—tolls, impost duties—were levied; and with the extension of citizenship characteristic of the modern State, the duty of paying taxes has become practically universal. The broadening of the functions of the State, noted under Finance, has had the effect of making taxation an increasingly important element in economic life. In general, the higher the social and economic development of a nation, the heavier is the burden of taxation upon its citizens.

Principles of Taxation. Writers on finance are accustomed to lay down certain general principles of justice and of administration to which practical systems should conform. Taxes should be capable of yielding a large revenue; they should be economical, i.e. the cost of collection should not materially increase the burden imposed upon the taxpayer; they should be elastic, capable of responding to a sudden demand for revenue; they should not impair their source through discouraging industry. So far as possible, they should be collected in such a way as to cause the taxpayer the least inconvenience; they should be certain, so that each man might know what he might be expected to pay and make provision accordingly. Most important of all, they should be equitably distributed.

On what principle the distribution of taxes should be made is a question on which financial theorists are far from an agreement. In the first half of the nineteenth century most writers regarded a tax as a payment to the State for protection, or for the privilege of securing an income under the laws of the State. It followed from this view that taxes should be distributed according to the benefit received, or according to the cost incurred by the State in affording the benefit. Such a principle proved unsatisfactory, since both benefit and cost are indeterminable. In recent years the doctrine which has the widest following teaches that since civilized existence is conditioned by the State, each individual is born with the duty of contributing to the needs of the State in proportion to his ability or faculty. This theory more nearly than any other corresponds with public sentiment and with the actual practice of taxation.

Proportional, Progressive, and Degressive Taxation. A system of proportional taxation is one in which the contribution from income or wealth remains a constant percentage, whatever the size of the latter may be. It is defended on the ground that it approximates the ideal of taxation according to ability. Progressive taxation, in which the contribution increases relatively to income or wealth, may be defended on the same ground, since one who possesses a large income is obviously more able to surrender a certain percentage of it than one who has a small income is to surrender an equal percentage. More often it is advocated as a measure of social equalization. Degressive taxation, in which the contribution diminishes relatively to income or wealth, has no valid defense; it exists only because of the imperfection of the taxing machinery, which finds less difficulty in levying upon small aggregates of wealth than upon large.

An ideal system of taxation would be a single tax on incomes. Such a tax would have to take account of the necessary expenditures of individuals, since these affect faculty; it would also take account of the character of income, whether funded or unfunded, since the former, being more certain, places its recipient in a better economic position than the latter. Income taxes, however, have proved practicable to only a limited extent. (See below.)

A tax on all property would approximate the same end, since the value of property is closely dependent upon the income it yields. This tax was practicable enough when almost all property was tangible and incapable of concealment. It is the most unsatisfactory of systems when, as at present, a vast amount of property consists in intangible personality. For these reasons, a multiple system of taxation, direct and indirect, is necessary to provide satisfactory revenues and to approximate fairness in distribution.

Shifting and Incidence of Taxation. The problems of taxation are immensely complicated by the fact that a tax may not rest upon the persons who pay it in the first instance, but may be shifted in whole or in part through price changes. A tax upon the output of a factory would naturally result in an equal rise in price. The manufacturer might pay the tax, but its ultimate incidence is upon the consumer. A tax on houses might temporarily be borne by the owner, but in the nature of the case it would ultimately result in higher rents, since it would put a check upon building. A tax on land value, on the other hand, could not be shifted, since it would not affect the amount of land available for use, and hence could not raise rents.

Direct and Indirect Taxes. A classification of taxes of much practical importance is that which distinguishes between direct and indirect. The distinction cannot be sharply drawn; but it may in general be said that direct taxes are those which are levied upon the persons or property of those upon whom they are expected to rest, while indirect taxes are levied upon commodities or industrial processes with the expectation of their further diffusion. Examples of the former kind are the poll tax, the general property tax, and the income tax. Examples of indirect taxes are customs duties and excise taxes. The practical advantage of indirect taxation lies in its ease of collection, and in the fact that it creates a minimum of opposition on the part of the taxpayer, who does not recognize that he is paying a tax through the enhancement of price of articles which he may purchase or not as he chooses. This very fact gives rise to one of the chief disadvantages of such taxation: namely, that it encourages wasteful administration, since the financier is not held to such strict account for funds raised in this way. A further objection to indirect taxation is that it weighs most heavily upon the poor, since it is only commodities in general use which can yield a considerable revenue through indirect taxation.

FORMS OF TAXATION. The simplest form of taxation is the poll tax, a head tax levied equally upon all citizens or inhabitants. This tax was not uncommon in England toward the close of the Middle Ages; it was an important form of taxation in the New England colonies. Where it still exists it is of minor importance. A tax on general property was developed in the northern colonies of America. Taxes on houses are discussed under the title HOUSE TAX (q.v.). Land is in some countries, as in the United States, taxed at the same rate as other forms of property; in other countries a special land tax is levied. A tax on land if permanent has the peculiarity of diminishing the value of the land by the capitalized value of the tax; it may therefore be said to be borne wholly by the one who owns the land at the time when the tax is first imposed. In New Zealand the tax on land is graduated with the size of the holding. The aim of this system is to prevent the accumulation of holdings in a few hands.

For inheritance tax, see that title.

The chief forms of indirect taxes are customs duties (see TARIFF) and excise taxes, or taxes upon the production or sale of commodities. The latter are common wherever business is highly developed. They are employed in England to offset duties on imports, which would otherwise serve to protect the native producer.

TAXATION IN THE UNITED STATES. There are no constitutional restrictions upon the power of the Federal Government over taxation save that "no capitation or other direct tax shall be laid unless in proportion to the census or enumeration," "no tax or duty shall be laid on articles exported from any State," "no preference shall be given . . . to the ports of one State over those of another," and "that all duties, imposts, and excises shall be uniform throughout the United States." The power of the States to tax is also practically unlimited, except that they may not tax interstate commerce, or levy import or export duties, or exercise the right of taxation in a manner to impair the obligation of a contract or to confiscate property without due process of law. The State Constitutions in many cases place further limitations upon the power of taxation exercised by the State Governments. The two fields of National and State taxation have been on the whole well defined and separate since the adoption of the Federal Constitution. While there is no legal objection to the right of the State to levy excise taxation, the prohibition of taxation of like commodities entering the State by interstate commerce renders this right nugatory; the States are therefore practically confined to direct taxation, and the Federal Government has refrained from entering this field of taxation except in periods of great national emergency.

STATE TAXATION. In the majority of American States the basis of the fiscal system is found in the general property tax, levied both for State and local purposes, upon the realty and personalty of the inhabitants of the State. This tax, although general, is now being abandoned or at least limited in application, this being true of Vermont, Connecticut, Delaware, Pennsylvania, and Wisconsin. The tax has been frequently condemned on account of its inadequacy as a test of 'faculty' or ability to pay taxes and because of its failure to reach personal property. According to a report of a special committee of the California Senate on taxation and revenue (January, 1901) there is but one opinion throughout the whole country of the practical working of the tax, and this is "that it is inequitable, unfair, and positively unjust." The tax leads to understatement, to widespread perjury, and to numerous forms of evasion and dodging. Through the inefficiency and occasional dishonesty of assessors, and through their frequent dependence upon popular favor, property of all sorts, and more especially personal property, escapes its just burdens, while in many cases the system of basing the taxation of the State upon the local assessment leads to a competition among the various districts of the State to keep their local assessment unreasonably low and thus evade, as far as possible, the burden of the State general property tax. The resulting inequalities are only partially remedied by the various State Boards of Equalization which now exist in about one-half of the States and which exercise the right to raise or lower the assessment of counties and in cases even to alter the assessment of individuals. It has, moreover, been found impracticable to secure good results by imposing severe penalties for evasion or by paying portions of the tax to persons discovering such evasions. Remedial legislation has been proposed in several States, but the Industrial Commission in its final report went beyond such palliative measures and recommended "that the States abandon the general property tax"—but "that local revenues be raised by taxes on real estate and personalty under the general property tax system, as at present."

Mortgages are taxed in most States together with the other forms of personalty, and as no deduction is usually made in the assessment of mortgaged property, the imposition of the tax on mortgages usually amounts to double taxation. Attempts have been made in Massachusetts, California, Oregon, and elsewhere to prevent this double taxation of mortgaged property as well as in some cases to shift the burden of the tax from the borrower to the lender. The tax in its present form is also criticised on the ground of its frequent evasion.

The general property tax, while practicable for a new, homogeneous, agricultural country, becomes objectionable in a more highly developed community owing to the escape of personalty, which has grown more rapidly in value than real property. The legal exemption of intangible personal property has been advocated (notably by the Massachusetts Tax Commission of 1897) because of its practical escape under present conditions and because it is claimed to be usually nothing but an evidence of ownership or of an interest in tangible property already taxed. The proposal to exempt intangible personal property has never met with the approval of the farmers or owners of rural property, unless it is accompanied by some means of reaching the property or income of which the intangible personal property is the title or evidence of ownership. There are also advocates of the exemption of taxes on improvements on land as well as adherents of a single tax on land values that will absorb the whole value of the land. See Single Tax.

In connection with the general property tax, many of the Southern States also depend upon a number of license or privilege taxes upon various forms of business, exhibitions, etc., and in 1901 a special committee of the Senate of California advocated like taxes for that State. In the South the tax is not graduated, but is usually a fixed charge, and according to Seligman (*Essays in Taxation*) is the natural result of the economic constitution of the South in the past. The aristocratic landed interest did not desire to tax themselves by a land or poll (slave) tax, but attempted to shift the burden in colonial days by taxing imports and exports, and, after the adoption of the Constitution of the United States, by levying business taxes or licenses.

A few States levy an income tax, in some cases instead of the general property tax, in others in connection with it. The income tax law of Massachusetts has survived from colonial days. It exempts incomes under $2000, taxing only the excess, and exempts also the income from property already taxed. It is laxly administered. There are also income taxes, or, as they are sometimes known, occupation taxes, in Louisiana, Pennsylvania, Virginia, North Carolina, and South Carolina.

The assessment of the property of corporations by local bodies under the general property tax has everywhere been found to be inadequate, and the expedient has commonly been resorted to of assessing the property of such corporations by a State board instead of by local assessors. Corporations are taxed, however, on another basis than that of the value of their property. According to Professor Seligman, the basis of taxing corporations in the United States has been: (1) the value of the property; (2) the cost of the property; (3) the capital stock at par value; (4) the capital stock at market value; (5) the capital stock plus the bonded debt at market value; (6) the capital stock plus total debt, both funded and floating; (7) the business transacted; (8) gross earnings; (9) dividends; (10) capital stock according to dividends; (11) net earnings; (12) value of franchise. Several States have accepted gross revenue or net earnings as a basis for taxation, and in several States, Wisconsin, Michigan, etc., this tax is progressive. A feature of recent taxation is the so-called special franchise tax. A tax of this sort, which falls upon "franchises for the use of streets granted by municipalities to public-service corporations," was passed by the New York Legislature in 1899, and a somewhat similar tax was levied in New Jersey in 1900. One of the most serious drawbacks to the just and equitable taxation of corporations lies in the interstate location of their property and the interstate character of their business and the consequent frequent conflicts of jurisdiction. To prevent this Prof. Henry C. Adams advocates the Federal taxation of interstate commerce, while another authority on finance (Professor Seligman) urges uniformity of State action or, in default thereof, taxation by the Federal Government and subsequent redistribution of such revenue among the States.

Federal Taxation. The revenue of the Federal Government has been obtained principally from customs and internal revenue duties. From 1875 to 1898, inclusive, the receipts from internal revenue fluctuated between $111,000,000 and $171,000,000, then during and after the Spanish War they rapidly rose to $307,000,000. Of this amount $254,000,000, or over four-fifths, were obtained from spirits, fermented liquors, and tobacco in the order named, $39,000,000, or 13 per cent., from the stamp taxes, and the remainder from legacies and distributive shares of personal property, oleomargarine, playing cards, special taxes not otherwise enumerated, penalties, etc.

The following table shows the receipts of the Federal Government from taxation for the ten years 1892-1901:

	Customs revenue	Internal revenue
1892	$177,452,964	$153,971,073
1893	203,355,017	161,027,624
1894	131,818,530	147,111,233
1895	152,158,617	143,421,672
1896	160,021,752	146,762,865
1897	176,554,127	146,688,574
1898	149,575,062	170,900,641
1899	206,128,482	273,437,162
1900	233,164,871	295,327,927
1901	238,585,456	307,180,664

In 1894 and from 1898 on, the internal revenue has been more productive than the customs revenue, this having been also true during the fiscal years from 1864 to 1868, inclusive. The cost of collecting the customs revenue in 1901 was 3.23 per cent. and that of collecting the internal revenue was 1.43 per cent., or $1 of cost for $70 collected.

Bibliography. The best works in English which cover the general subject of taxation are: Adams, *Public Finance* (New York, 1898); Seligman, *Essays in Taxation* (New York, 1895); Bastable, *Public Finance* (London, 1895). For American conditions, see Ely, *Taxation in American States and Cities* (New York, 1888). See also: Seligman, *Shifting and Incidence of Taxation* (Baltimore, 1892); id., *Progressive Taxation* (Baltimore, 1894); Cohn, *Science of Finance* (trans., Chicago, 1895). Taxation is treated in most of the standard works on Political Economy; for references, see that article. See also references under FINANCE.

TAXATION OF COSTS. The official review and confirmation of the amount of costs due a successful litigant. In England the court determines the way in which the costs shall be taxed, and this is done before a taxing master, or registrar. The official performing similar duties in Scotland is known as the auditor.

In the United States the clerk of each court usually taxes the costs of successful parties. His rulings may be reviewed by the court upon motion. See COSTS.

TAX DEED. A properly authenticated instrument by which a public officer transfers land sold for taxes. As it does not represent the free act of the owner of the land, its validity depends upon the constitutionality and regularity of the tax sale, the proceedings in which it usually recites. The deed may run in the name of the State, or in the name of the officer executing it in his official capacity. Delivery of the deed may be compelled by mandamus. See TAX SALE.

TAXIDERMY (from Gk. *τάξις*, *taxis*, arrangement + *δέρμα*, *derma*, skin). The art of skinning, preserving, and stuffing the skins of animals, and of mounting them for exhibition. Before skinning all animals should be carefully measured. When possible make the measurements prescribed by taxidermists. Also make drawings and if possible casts of those parts whose form and expression are characteristic and can adequately be expressed in no other way. These precautions have reference to the mounting of the animals in a truly life-like attitude and form. The mounting of animals requires experience and, for the greatest success, an artist's eye for form and a sculptor's skill in modeling. The skin should be carefully removed from the body to the tips of the toes and to the bill in the case of the bird. Directions as to where and how far to cut the skins of the various sorts of animals may be found in taxidermists' guides. Do not cut the skin at the claws and beak, and in the case of birds, leave the skull within the skin. Clean the leg and skull bones of all flesh, clear out the brain, and preserve the skin and all it contains by anointing it thoroughly on the inside with arsenical soap. Many taxidermists prefer to have the entire pelvic and pectoral girdles preserved at least.

The subsequent treatment of the skin depends somewhat on whether the specimen is to be mounted, and upon the facilities at hand and the ease and cost of transportation. Except in the case of young, and of certain species, the skins of mammals, whether preserved in the field or in the laboratory, should if possible be preserved *wet*—in a salt and alum bath. The proportions recommended by Hornaday are: to one gallon of water add three-fourths of a pound alum (one pint) and 1¾ pounds salt (1 quart); heat to near the boiling point until the crystals are all dissolved. When possible test with a salometer, where liquid should stand at 15°. Do not allow the liquid to remain in a zinc or galvanized vessel. Immerse the skins in the cooled solution. For the first two or three days do not allow the skins to crumple or fold, and to facilitate the penetration of the fluid to all parts of the skins stir them about in the fluid. Keep greasy skins by themselves and replace a dirty and bloody preservative by a clean one.

Skins for mounting should be preserved *dry* only when the lack of facilities and the cost of transportation render the wet method prohibitive. By the dry method the skins may be preserved with arsenical soap. When the soap is all absorbed the skins should be dusted with finely powdered salt and alum in equal proportions. Very good skins may be prepared with salt alone in an emergency; but such skins should be guarded against the attacks of insects, rats, mice, cats, dogs, etc.

Bird skins may be preserved either with powdered arsenic and alum or with arsenical soap. Before removing the skin of a bird plug the vent and nostrils with cotton. Dirt and blood-spots should then be washed out with water and the feathers dried with generous and repeated sprinkling of meal, plaster of Paris, or sawdust. The skin having been removed and anointed with the preservative, replace the skull (using great care here as elsewhere not to stretch or tear the delicate skin); gently fill the eye-sockets and throat with cotton to their natural fullness; wind the wing-bones and legs with cotton to an amount equal to the muscles removed, and gently draw them down into the skin of the arms and legs, which should be placed in a natural position. Then make as close an imitation of the body as possible (of cotton for little birds and of tow for large ones), insert it into the skin, packing it in just sufficiently to fill out all the natural roundness and no more, and draw the skin over it. Next smooth all the feathers carefully, lay the wings naturally beside the body, and tie them there by many windings of thread round and round the whole length of the body. This done lay the bird on its back on a board, stretch out the beak and tail, and fasten them in position if necessary and leave the specimen in an airy place until thoroughly dried. A light label should be attached to the leg. Skins so preserved are better for study purposes than when mounted, as they are easily handled, take less room in a cabinet, and are more easily cared for. When properly preserved they may be prepared for mounting at any time by softening, by means of wrapping in damp cloths for several hours or days.

The mounting of skins is a very elaborate process, and good results depend not only upon acquired skill, but upon a knowledge of anatomy, bionomics, and good artistic taste. In the case of the smaller birds and animals it consists of arranging wires lengthwise of the body and the limbs, so connected as to support the body in a life-like attitude; but large animals must have the substance of the body replaced by some firm material, such as clay or some plastic composition, which must be modeled with great intelligence if the figure, after the skin has been drawn over it and fastened, is to be satisfactory.

Consult: Hornaday, *Taxidermy and Zoölogical Collecting* (New York, 1892); Rowley, *The Art of Taxidermy* (New York, 1898).

TAXILA, tăk′sē-lȧ (Lat., from Gk. Τάξιλα, Chin. *Chu-sha-shi-lo*, from Skt. *Takṣakaśila*, rock of Takshaka, a Naga king, or, less probably, *Takṣaśila*, carved rock, or from Pali *Takkasila*, rock of the Takkas, a tribe living between the Indus and the Chenab). A famous city of ancient

India. It was situated near the modern village of Dheri Shahan, on the little stream Tabranala, in the District of Rawalpindi, in the Punjab. It was one of the most populous and wealthy of all the cities of India. It was the residence of Aśoka (q.v.) while he was Viceroy of the Punjab. During the early part of the second century B.C. Taxila probably formed part of the dominions of the Græco-Bactrian King Eucratides. The Sus or Abars became its masters B.C. 126, only to lose it at the beginning of the next century to Kanishka, King of the Kushans. Consult: McCrindle, *Invasion of India by Alexander the Great* (Westminster, 1896); id., *Ancient India as Described in Classical Literature* (ib., 1901).

TAXONOMY (from Gk. *τάξις*, *taxis*, arrangement + *νόμος*, *nomos*, law, from *νέμειν*, *nemein*, to distribute) IN PLANTS. The classification of plants. Probably the first scientific study of plants was the attempt at classification. Artificial classifications, beginning with the most ancient one into herbs, shrubs, and trees, and culminating in the Linnæan system (see BOTANY) in the middle of the eighteenth century, were at first necessary on account of lack of knowledge of the structure of plants. Such classifications simply catalogued and pigeonholed the rapidly accumulating material, in preparation for a classification based upon natural relationships. Natural systems have been evolving since the eighteenth century; being modified by every advance in morphological knowledge, none are abreast of current opinion, and no final classification seems to be in sight. Each newly proposed system, however, approaches to it. The present system is a composite one, not being referable to any single systematist, but having had a somewhat natural and very slow development. In its larger outlines it is presented below. All of the groups mentioned are described under their several titles.

At present four primary divisions of the plant kingdom are recognized, as follows:

IV. Spermatophytes or Seed-plants.
III. Pteridophytes or Fern-plants.
II. Bryophytes or Moss-plants.
I. Thallophytes or Thallus-plants.

These categories are distinct enough, and there is no difficulty in assigning all plants to them, but the question arises, Are they equivalent groups? Some think there should be more primary groups, and others fewer. Beginning with the lowest great division, there is an increasing complexity. An easy differential way of separating the groups is as follows: *Thallophytes* have thallus-bodies but no archegonia (q.v.); *bryophytes* have archegonia but no fibro-vascular bundles; *pteridophytes* have fibro-vascular bundles but no seeds; *spermatophytes* have seeds.

I. THALLOPHYTES, the least natural group of the four, comprise what seems to be a heterogeneous mass of forms. They are divided into two great parallel series, algæ and fungi, the former containing chlorophyll (green pigment) and being independent plants, the latter containing no chlorophyll and being parasites or saprophytes. The algæ are usually subdivided as follows:

- Algæ
  - Rhodophyceæ or red algæ.
  - Phæophyceæ or brown algæ.
  - Chlorophyceæ or green algæ.
  - Cyanophyceæ or blue-green algæ.

It is a serious question whether the Cyanophyceæ should be included in this way with the other algæ, for they appear to be far more nearly related to the bacteria, a group of fungi. The classification of the fungi is in a very unsatisfactory state, but the plants are for the most part being treated under the following heads:

- Fungi
  - Basidiomycetes or basidium fungi (toadstools and their allies, including rusts and smuts).
  - Ascomycetes or sac-fungi (mildews, lichen-fungi, etc.).
  - Phycomycetes or alga-like fungi (molds, downy mildews, etc.).
  - Schizomycetes or fission-fungi (bacteria).
  - Myxomycetes or slime molds.

The first three groups are regarded as true fungi; the last two are problematical as to their relationships, often being regarded as distinct from the fungi.

II. BRYOPHYTES form a very natural group, the two great series being liverworts (Hepaticæ) and mosses (Musci). Their principal subdivisions are as follows:

- Bryophyta
  - Musci
    - Bryales.
    - Sphagnales.
  - Hepaticæ
    - Anthocerotales.
    - Jungermanniales.
    - Marchantiales.

III. PTERIDOPHYTES also form a natural group, though the main divisions are very dissimilar in appearance. They are as follows:

- Pteridophyta
  - Lycopodiales or club-mosses.
  - Equisetales or horsetails.
  - Filicales or ferns.

IV. SPERMATOPHYTES should probably be divided into two primary groups, although at present they are treated as one. The two great divisions, gymnosperms and angiosperms, differ more in essential features from one another than does the former group from pteridophytes, but they are held together at present by the common character of seed production. The existing gymnosperms are grouped as follows:

- Gymnospermæ
  - Gnetales.
  - Coniferales (pines and their allies).
  - Ginkgoales (maiden-hair tree).
  - Cycadales (cycads).

The angiosperms comprise a vast assemblage of forms that are easily separated into two great series, monocotyledons and dicotyledons, but whose further division is at present in a somewhat chaotic state. Most of the subdivisions heretofore suggested are confessedly artificial, and probably as far as one may go safely with natural groups is as follows:

- Angiospermæ
  - Dicotyledones
    - Sympetalæ.
    - Archichlamydeæ.
  - Monocotyledones

The unit of classification used by taxonomists is the *species*, a group very difficult to define, but understood in a general way. The species always bears two names, as Quercus alba, the systematist's name for white oak, 'alba' indicating the species, and 'Quercus' the genus to which the species belongs. In some cases forms of a species may be distinct enough to be characterized, and are called varieties, being designated by adding a third name to the species binomial. The next higher taxonomic group is the *genus*, which comprises one or more species. For example, 'Quercus' is the oak genus, containing one or many species. The next higher taxonomic category is the *family*, which comprises one or more genera, and is indicated except in a few exceptional cases by the common termination 'aceæ,' as 'Rosaceæ,' the rose family. The next higher category is the *order*, the form of whose designation is not so fixed as that of the family, but which is increasingly indicated by the termination 'ales,' as 'Coniferales.' Still higher categories are often employed, but the usage is so variable that nothing definite can be stated in reference to them. All of these categories have their intermediate subdivisions, which general usage has in the main established. For example, a genus may have its species grouped into *subgenera;* a family may be broken up into *tribes*, each containing its own genera; and an order often has its *suborders.*

The literature of taxonomic botany is vast in extent, and a complete list of even the most important works cannot be cited. No work as yet contains a systematic presentation of all the known species of plants. The most extensive current works are as follows: Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig), completed in four sections, each containing numerous parts, and including all known genera; Bentham and Hooker, *Genera Plantarum* (London, 1863-83), including all known genera of flowering plants; Engler, *Das Pflanzenreich* (Leipzig), a few parts of which have appeared, and which is planned to be completed in twenty years, including descriptions of all known species of plants.

Each country has its own manuals containing descriptions of its flora. The current manuals dealing with the flowering plants and in some cases the fern plants of the United States are as follows: Gray, *Manual of Botany* (6th edition, revised by Watson and Coulter, New York, 1890), including Northeastern United States; Britton and Brown, *Illustrated Flora of the Northern United States and Canada* (ib., 1896-98); Britton, *Manual* (ib., 1901), including the same range; Chapman, *Flora of the Southern United States* (3d edition, Cambridge, Mass., 1897); Small, *Flora of the Southeastern States* (New York, 1903); Coulter, *Manual of Rocky Mountain Botany* (New York, 1885); id., *Botany of Western Texas* (Washington, 1891-94); Brewer, Watson, and Gray, *Botany of California* (Cambridge, Mass., 1876 and 1880); Greene, *Manual of the Bay-Region Botany* (San Francisco, 1894), including region south of Maryland and Kentucky west to 100th meridian; Howell, *A Flora of Northwest America*, not yet complete (Portland, Oregon, 1897—); Rydberg, *Flora of Montana* (New York, 1900). The only attempt to include in a single work the whole flora of North America is Gray's *Synoptical Flora of North America*, incomplete (1878-95). For pteridophytes (fern-plants) of the United States, consult: Underwood, *Our Native Ferns and Their Allies* (New York, 1888); Clute, *Our Ferns in Their Haunts* (New York, 1901). For mosses of the United States, see Lesquereux and James, *Mosses of North America* (1884; out of print); Barnes, *Keys to North American Mosses* (Madison, Wis., 1896); Grout, *Mosses with a Hand Lens* (Brooklyn, 1900; revised and enlarged, 1903). For the important taxonomic literature of algæ and fungi, see articles on the principal groups.

TAX SALE. A public sale of land by proper officials acting under authority of law, to collect the amount due for unpaid taxes. The requisites and details to be followed vary widely in the different States, but certain general principles are common. The taxes must be constitutional and be legally assessed; they must be due and unpaid; a proper return of the fact of the delinquency must have been made; the land must be advertised for sale at a definite time and place, and must be sold at public auction to the highest bidder. In some States, if it is practicable to sell a portion of the land for enough to satisfy the unpaid taxes, it is mandatory on the tax collectors to advertise and sell it in that way. However, it is usual to sell tracts of land as they are assessed. Most States allow the owner to redeem the land within a specified period, usually upon payment of the amount paid by the purchaser and a fixed rate of interest. Accordingly, immediately after the sale it is customary to give the purchaser merely a certificate which will entitle him to demand a tax deed upon the expiration of the time for redemption. See Taxation; Tax Deed; Title.

TAX TITLE. The interest or title acquired by a purchaser of land at a tax sale. If the sale be valid, the validity of the title depends upon the failure of the owner to redeem within the proper time. Until the expiration of the time allowed for redemption, the purchaser has practically only a right in the nature of a lien on the property. See Tax Sale.

In most States the deed is *prima facie* evidence of title in the purchaser. In many States, after the expiration of the time for redemption, a tax title is made superior to all other claims. In a few States, however, the purchaser gets only the right of the delinquent taxpayer and, therefore, the title may be very precarious. When the tax title of a purchaser in good faith proves to be invalid for any reason, he is generally allowed to recover the purchase price, and may recover from the owner the actual value of any reasonable improvements he may have made. See Taxation; Tax Sale; Title.

TAY, tā. A river of Scotland draining the greater part of Perthshire (Map: Scotland, E 3). It rises as the Dochart on the border of Argyllshire, and flows first eastward, traversing the beautiful Loch Tay, then southeast, and finally northeast as the Firth of Tay, a broad tidal estuary through which it enters the North Sea, 10 miles below Dundee. It is 118 miles long and navigable for small vessels to Perth, though the mouth of the estuary is obstructed by sand banks. The estuary is spanned by an iron railroad bridge over 3000 yards long.

TAY, Loch. A lake in West Perthshire, Scotland, situated in a mountain basin, 355 feet above the sea-level. It is about 15 miles long, with an average breadth of one mile, and varies from 100 to 600 feet in depth (Map: Scotland, D 3). Its picturesque features and salmon fishing make it a favorite tourist and angling resort. Ben Lawers, on its western side, rises 2945 feet.

TAYABAS, tȧ-yä'bȧs. A province of Luzon, Philippine Islands, occupying the isthmian portion between the central and southern part of the island, and the region along the east coast of Central Luzon, formerly included under the districts of Infanta and Príncipe (Map: Luzon, H 10). These two districts and the large island of Polillo (q.v.) lying to the east of them were annexed to the province in 1902. Total area, 4429 square miles, of which the dependent islands take up 491, and of these the island of Polillo 294 square miles. The entire mainland portion is occupied by a high coast range covered with forests and generally inaccessible and unexplored except in the isthmian region, where alone there are means of communication. The northern districts are undeveloped, but in Tayabas proper there are some agriculture and cattle-raising, and considerable mechanical industries, including weaving, the manufacture of hats, cigar-boxes, and cocoanut oil, and boat-building. Population estimated in 1901 at 131,045, consisting of Tagálogs in the south and Ilongotes and Negritos in the north. Capital, Lucena.

TAYABAS. A town of Tayabas Province, Luzon, Philippines, situated on the east bank of the river of the same name, sixty-five miles southeast of Manila (Map: Luzon, H 11). It is the centre of a large inland and coast trade, and has a dockyard for native vessels. Population, about 15,000.

TAYGETUS, tâ-ĭj′ê-tŭs (Lat., from Gk. Ταῦγετος), now called PENTEDAKTYLON. The principal mountain range of the Peloponnesus, Greece (Map: Greece, D 5). It extends southward through the middle of the peninsula and forms the central one of the three promontories in which Southern Greece terminates. It is an almost unbroken ridge, and reaches in Mount Hagios Elias an altitude of 7903 feet. It formed the ancient boundary between Laconia and Messenia.

TAY′LER, JOHN JAMES (1797-1869). An English Unitarian. He was born at Church Row, Newington Butts, Surrey; graduated B.A. at the University of Glasgow, 1818; and was minister of a Unitarian congregation at Manchester, 1820-53. In 1840 he became professor of ecclesiastical history in Manchester New College, and in 1852 also professor of theology. When the college was removed to London (1853), he became principal. He was co-pastor with Rev. James Martineau of the Unitarian congregation in Little Portland Street (1850-60). He published *Retrospect of the Religious Life of England* (1845; 3d ed. 1876); *Christian Aspects of Faith and Duty* (2 series, 1851-1877); *Attempt to Ascertain the Character of the Fourth Gospel* (1867; 2d ed. 1870). Consult his *Life and Letters* by J. H. Thom (London, 1872).

TAY′LOR. A city in Williamson County, Tex., 35 miles northeast of Austin; on the Missouri, Kansas and Texas and the International and Great Northern railroads (Map: Texas, F 4). The buildings and grounds of the Fair Association and artesian wells are noteworthy features of the city. Taylor is the centre of extensive cotton interests, and also has considerable trade in farm produce, live stock, wool, etc., and manufactures of flour and cottonseed oil. The International and Great Northern Railroad maintains repair shops here. Population, in 1890, 2584; in 1900, 4211.

TAYLOR, ALFRED SWAINE (1806-80). A celebrated English medical jurist, born at Kent. He studied in the united hospitals of Guy and Saint Thomas in 1823, and upon their separation attached himself to Guy's, where he studied under Sir Astley Cooper and Joseph H. Green. In 1831 he began to deliver at Guy's Hospital the first English course of lectures on medical jurisprudence. In 1832 he became joint lecturer with Aikin on chemistry at Guy's, and he held this chair alone from 1850 to 1870. His great work, *Elements of Medical Jurisprudence* (1836), had passed through twelve editions by 1891, and during this period was the standard work on the subject. This work won for him in 1859 the Swiney prize. He first drew attention to the great incentive for secret murder offered by life insurance, and to the possibility of arsenical poisoning from wall papers and other fabrics. His *Handbook on Poisons* (1848) is his other notable work.

TAYLOR, [JAMES] BAYARD (1825-78). An American poet, man of letters, journalist, and traveler, born at Kennett Square, Chester Co., Pa. His education was obtained in the common schools of the neighborhood. He became, in 1842, the apprentice of a printer, and here he published his first volume, *Ximena; or the Battle of the Sierra Morena, and Other Poems* (1844). In 1844-45 he made a pedestrian tour through Europe, describing his experiences in *Views Afoot; or Europe Seen with Knapsack and Staff* (1846). The following year, 1847, he joined the New York *Tribune*, and remained on the staff of that paper as long as he lived, publishing in its pages the sketches of many of his subsequent books. As its special correspondent, he visited California in 1849, where he spent five months among the gold-diggers; two years later he was in Egypt, Asia Minor, and Syria; in 1852-53 in India, crossing from Bombay to Calcutta, and then going to China to join the expedition of Commodore Perry to Japan. From 1862 to 1863 he was secretary of the United States legation at Saint Petersburg, and later *chargé d'affaires* there, and was influential in securing for the Northern States the sympathy of Russia. In 1874 he was again in Egypt, and the same year at the Millennial Celebration in Iceland. For several years previously he had lived in Germany, and there in 1870-71 he brought out the work for which he is best known, his excellent translation of Goethe's *Faust*. In 1876 he wrote the *Ode* in honor of the opening of the Centennial Exhibition in Philadelphia. In February, 1878, he was appointed Minister to Germany, and returned again to that country, but died there toward the end of the same year, leaving unfinished biographies of Goethe and Schiller. He was married in 1850 to Miss May Agnew, and in 1857, to Miss Marie Hansen of Gotha, Germany, who survived him, reëdited his works, and, with H. E. Scudder, wrote his *Life and Letters* (1884).

Taylor's work is very voluminous, and varied both in kind and in quality. He wrote books of travel, of which the chief are: *El Dorado; or Adventures in the Path of Empire* (1850); *A Journey to Central Africa* (1854); *A Visit to India, China, and Japan* (1855); *The Lands of the Saracen* (1855); *Northern Travel* (1858); *Travels in Greece and Russia* (1859); *At Home and Abroad* (1859 and 1862); *Colorado, a Summer Idyl* (1867); *By-Ways of Europe* (1869); *Egypt and Iceland in the Year 1874* (1874); and others. His novels include: *Hannah Thurston* (1863); *John Godfrey's Fortunes* (1864); *The Story of Kennett* (1866); *Joseph and His Friend* (1870). His poems were also very numerous;

besides *Ximena*, the chief volumes are: ***Rhymes of Travel, Ballads, and Other Poems*** (1849); ***The American Legend*** (1850), delivered before the Phi Beta Kappa Society of Harvard; ***A Book of Romances, Lyrics, and Songs*** (1852); ***Poems and Ballads*** (1854); ***Poems of the Orient*** (1855); ***Poems of Home and Travel*** (1855); ***The Poet's Journal*** (1863); ***The Picture of Saint John*** (1866); ***The Ballad of Abraham Lincoln*** (1870); ***The Masque of the Gods*** (1872); ***Lars, A Pastoral of Norway*** (1873); ***The Prophet, A Tragedy*** (1874); ***Home Pastorals, Ballads, and Lyrics*** (1875); and ***The National Ode*** (1876), all showing variety in subject and manner. He had a distinct lyrical faculty, as his beautiful "Bedouin's Song" proves, but he never seemed able to bring his varied powers under full artistic control. The public persisted in regarding him as a traveler and journalist rather than as a poet, and, despite the remonstrances of some friendly critics, it is probable that the public was right. At most he is a minor poet, a good translator, and a versatile writer of prose. Besides the biography by his wife, there is a *Life* by Albert H. Smythe, in the "American Men of Letters" series (1896), and a sketch of his personality is to be found in W. D. Howells's *Literary Friends and Acquaintance* (1900).

TAYLOR, BENJAMIN FRANKLIN (1819-87). An American author and journalist, born in Lowville, N. Y. During the Civil War he was with the Western armies as correspondent of the Chicago *Evening Journal*, and his letters attracted so much attention that many of them were translated and published in European papers. After the war he traveled and lectured for several years. He wrote many books, including several volumes of verse and a novel, *Theophilus Trent* (1887). He is probably best known by his poem "The Isle of Long Ago."

TAYLOR, BROOK (1685-1731). An English mathematician, born at Edmonton, Middlesex. He was educated at Cambridge. In 1712 he was made a fellow of the Royal Society, and two years later became its secretary. Taylor is chiefly known for a theorem which bears his name, and which appeared in his *Methodus Incrementorum Directa et Inversa* (1715), the first important treatise to deal with the calculus of finite differences. Taylor also contributed in a valuable way to the problem of the centre of oscillation (*Philosophical Transactions*, xxviii.), to the theory of vibrations of a string, and other questions of mathematical physics. His *Linear Perspective* (1715) and *New Principles of Linear Perspective* (1719) were a notable advance in the theory. They also contained an enunciation of the principle of vanishing points, the first in English and the most complete to that time. For biography consult the preface to his posthumous work, *Contemplatio Philosophica* (1793).

TAYLOR, CHARLES FAYETTE (1827-99). A celebrated American orthopædic surgeon, born in Williston, Vt., and educated at the University of Vermont. The year 1857 he spent in London, studying the Swedish movement cure under Roth. Subsequently he settled in New York City, and was one of the first to introduce the movement cure (q.v.) into this country. Dr. Taylor early became a specialist in orthopædic surgery, in which he was very successful. He was especially skillful in devising original appliances to meet deformities. Among his inventions are the Taylor splint for treatment of curvature of the spine and the long extension hip splint. He was the founder of the New York Orthopædic Dispensary and Hospital, of which he was the executive surgeon for many years. Taylor established in New York City an institute for the treatment of deformities, which was successfully operated for many years, previously to the organization of the hospital. His publications include: ***Principles and Practice of Hygeio-Medical Science***, with George H. Taylor (1857); ***The Movement Cure*** (1858); ***The Theory and Practice of the Movement Cure, or the Treatment of Lateral Curvature of the Spine***, etc. (1861); ***The Mechanical Treatment of Angular Curvature, or Potts' Disease of the Spine*** (1865); ***"Spinal Irritation" or the Causes of Backache Among American Women*** (1864); ***Infantile Paralysis and Its attendant Deformities*** (1867); and ***On the Mechanical Treatment of Disease of the Hip-Joint*** (1873).—DR. HENRY LING TAYLOR, son of C. F. Taylor, is an orthopædic surgeon of note, and professor of orthopædic surgery in the New York Post-graduate Medical School and Hospital.

TAYLOR, Sir CHARLES PURCELL (1863—). An English marine engineer. He was largely self-educated, but gradually became distinguished as a consulting engineer, especially in connection with marine practice. During the Civil War in Chile in 1891, he served successfully as an intermediary between the United States and Chile in the *Baltimore* affair. His principal publications, which have appeared as reports, include the following: *The Docks and Harbors of the World; Coal Mines and Iron Works of the World; Briquettes and Smokeless Fuel; The First Transatlantic Steamer; The Steering of Ships; Smokeless Powder;* and *The Choice and Use of Motor Cars.*

TAYLOR, DAN (1738-1816). Founder of the New Connection of General Baptists. He worked in the mines of Yorkshire till 1762. After having been for a year one of Wesley's preachers he seceded, but continued preaching. In 1763 he united with the General Baptists and rose to prominence as a preacher among them. In 1769 he headed a secession from that body. (See BAPTISTS.) His better known works embrace: *A Compendious View of Christian Baptism* (1772); *Fundamentals of Religion* (1775); and *The Eternity of Future Punishment* (1789, written against the Universalist Elhanan Winchester). Consult his biography by Adam Taylor (London, 1820), and by W. Underwood (ib., 1870).

TAYLOR, EDWARD THOMPSON (1793-1871). An American preacher, widely known as 'Father Taylor.' He was born in Richmond, Va.; was taken in charge by a lady near that city; ran away to sea at the age of seven, and for ten years was a sailor. In the War of 1812 he served on a privateer, the *Black Hawk*, was captured, and was confined first at Melville Island and then in Dartmoor Prison, where he became the chaplain to his fellow prisoners, having joined the Methodist Episcopal Church in 1811. After his release from prison he was successively a peddler of tin and ironware and a buyer of rags, and a farmer; was regularly licensed to preach in 1814; and in 1819 became an itinerant Methodist minister. In 1829 he was chosen minister of the newly established Seamen's Bethel in Boston, which position he held until 1868, when he resigned. He visited Europe in 1832 and Palestine in 1842, and was chaplain to the United States frigate sent with relief to Ireland during the famine of 1846. By his warmth of heart, his native wit, and his natural eloquence he gained a remarkable influence over his sailor auditors, and throughout the United States he was regarded as in some respects the most eloquent preacher of his day. Numerous anecdotes have been told to illustrate his wit and his power as a public speaker, and accounts of his eloquence may be found in Miss Martineau's *Retrospect of Western Travel*, in Buckingham's *America, Historical, Statistic and Descriptive*, in Dickens's *American Notes*, in Miss Bremer's *The Homes of the New World*, and in Mrs. Jameson's *Commonplace Book of Thoughts, Memories, and Fancies.* Walt Whitman spoke of him as an "essentially perfect orator." Consult Haven and Russell, *Father Taylor, the Sailor Preacher* (Boston, 1872).

TAYLOR, George (1716-81). A signer of the Declaration of Independence, from Pennsylvania. He was born in Ireland, emigrated to America as a redemptioner in 1736, and, after serving a wealthy manufacturer as a clerk, married his employer's widow. He became very wealthy, was a member of the Provincial Assembly from 1764 to 1770, and on July 20, 1776, was chosen a member of the Continental Congress. He served only a short time, retiring in March, 1777. Consult: Sanderson, *Signers of the Declaration of Independence* (Philadelphia, 1825-27).

TAYLOR, Hannis (1851—). An American lawyer and diplomat, born at Newbern, N. C. He was educated at the University of North Carolina. From 1893 to 1897 he was United States Minister to Spain. In 1899 he published the first volume, followed in 1898 by the second volume of *The Origin and Growth of the English Constitution*, a work in which he attempted not only to trace the history of the English system of government, but also the growth therefrom "of the Federal Republic of the United States."

TAYLOR, Sir Henry (1800-86). An English poet, born at Bishop-Middleham in Durham. He began writing verses in the Byronic manner and was soon contributing clever articles to the *Quarterly Review*. Encouraged by Southey, whom he visited at the Lakes, he settled in London as a man of letters (1823). In 1824 he was given a clerkship in the Colonial Office, a post which he filled with great ability till his resignation in 1872. He made warm friendships with Mill, Lockhart, Rogers, Carlyle, Spedding, Aubrey de Vere, and many other literary men. In recognition of his services to the Government and to literature, he was made K.C.M.G. (1869). His last years were passed at Bournemouth. Taylor's literary fame rests secure on *Philip Van Artevelde* (1834; performed by Macready, 1847), one of the most poetic tragedies since the Elizabethan age. Other tragedies in the same style but of less merit are *Isaac Comnenus* (1827), *Edwin the Fair* (1842), and *Saint Clement's Eve* (1862). *The Virgin Widow*, a dramatic poem (1850), is an experiment in romantic comedy. In 1847 Taylor published *The Eve of Conquest and Other Poems*. His strongest prose is represented by *The Statesman* (1836), a collection of ironical discourses on success, which were taken seriously; and by a charming *Autobiography* (1885; but privately printed, 1877), containing carefully drawn portraits of his early contemporaries. Consult his *Works* (Author's edition, 5 vols., London, 1878); selection from poems in Miles's *Poets and Poetry of the Century* (ib., 1891); and *Correspondence*, ed. by Dowden (ib., 1888).

TAYLOR, Henry Clay (1845-1904). An American naval officer, born in Washington, D. C. He graduated at the Naval Academy in 1863, was assigned to the West Gulf Blockading Squadron, and took part in the battle of Mobile Bay (August 5, 1864). After the Civil War he spent two years in the South Pacific Station, and on his return home was detailed for duty at the Naval Academy. In 1868 he was promoted to the rank of lieutenant-commander, and after taking part in a surveying expedition (1870-71), he again spent two years at the Naval Academy. In 1879 he was advanced to the rank of commander, and from 1881 to 1884 he commanded the *Swatara* on the Asiatic station. Two years after his return he was appointed commandant of the Norfolk Navy Yard, a post which he held two years. From 1893 to 1896 he was president of the Naval War College at Newport, R. I., and he was also for several years superintendent of the Naval Academy at Annapolis. In 1897 he was again ordered to sea service, and was appointed commander of the battleship *Indiana.* In the spring of 1898 he joined Admiral Sampson's fleet at Key West, and in May he took part in the bombardment of San Juan. The next month, with the *Indiana* and other war vessels, he conveyed General Shafter's army from Tampa to Santiago, and on July 3d, when Cervera came out of the harbor, his vessel took an important part in the destruction of the Spanish fleet. After the war he was placed in command of the receiving ship *Vermont*, and in 1902 he was appointed chief of the Bureau of Navigation.

TAYLOR, Isaac (1787-1865). An English miscellaneous writer, inventor, and artist, born at Lavenham, in Suffolk. He studied engraving under the direction of his father, with whom he executed the plates for Boydell's *Illustrations of Holy Writ* (1820), commended for their originality by Rossetti. Turning to literature, he joined the staff of the *Eclectic Review* (1818), for which he continued to write for many years. Some time before this he had begun the study of patristic literature and of Lord Bacon. He was known as the great lay preacher of his time. Of his publications we may mention: *The Elements of Thought* (1823; 11th ed. 1867), which grew out of his early studies of Bacon and the Church Fathers; a translation of the *Characters of Theophrastus* (1824) with etchings by himself; *The Natural History of Enthusiasm* (1829; 10th ed. 1845); *Saturday Evening* (1832), a devotional volume which had an immense sale in England and the United States; *Home Education* 1838; 7th ed. 1867); a translation of the *Jewish Wars* of Josephus (1847 and 1851); *Ancient Christianity and the Doctrines of the Oxford Tracts* (8 parts, 1839-40; 4th ed. 1844); and *The Spirit of Hebrew Poetry* (1861). His sisters Jane (1783-1824) and Ann (1782-1866), afterwards Mrs. Gilbert of Nottingham, became well known for their children's verses. Their *Original*

Poems for Infant Minds (1804-05), which ran through more than fifty editions in England and America, were also translated into German, Dutch, and Russian. Equally popular was *Rhymes for the Nursery* (1806), containing from Jane the familiar "Twinkle, twinkle, little star." The sisters also produced *Hymns for Infant Minds* (1810), which has passed through about one hundred editions. Ann wrote the hymn beginning "I thank the Goodness and the Grace." Consult: the *Taylors of Ongar*, by Isaac Taylor (London, 1867); the *Autobiography of Mrs. Gilbert*, ed. by Josiah Gilbert (ib., 1874); and the *Poetical Works of Ann and Jane Taylor* (ib., 1877).

TAYLOR, Isaac (1829-1901). An English ecclesiastic, born at Stanford Rivers. In 1885 he became canon of York Minster. He was the author of *The Liturgy and the Dissenters* (1860), and one or two other theological pamphlets; but was best known by his works on philology. His *Words and Places, or Etymological Illustrations of History, Ethnology, and Geography* (1864; 2d ed. 1865) was a work of great research as well as erudition. In *Etruscan Researches* (1874) Taylor tried, but unsuccessfully, to prove that the Etrurians were allied to the Mongolian races. In 1876 Taylor published *The Etruscan Language;* in 1883 his best known work, *The Alphabet* (2d ed. 1899); and later *The Origin of the Aryans* (1890) and *Names and Their Histories* (1896). He died at Settrington.

TAYLOR, Isaac Ebenezer (1812-89). An American gynæcologist. Educated at Rutgers College and at the medical department of the University of Pennsylvania, Dr. Taylor received his degree from the latter institution in 1834. He was professor of obstetrics and of the diseases of women and children in Bellevue Hospital Medical College, 1861-67; president of the same, 1861-89; professor emeritus, 1867-89. He is credited with the introduction, in connection with Dr. I. A. Washington, of the hypodermic use of medicines.

TAYLOR, Jeremy (1613-67). An English prelate and author. He was born at Cambridge, the son of a barber, and educated at Caius College. He was ordained before he had reached his twenty-first year, and attracted the attention of Laud, who procured him a fellowship at All Souls', Oxford. About the same time he was made chaplain to the King, and in 1638 rector of Uppingham. His first notable publication was *Episcopacy Asserted* (1642). His stand on the Church-and-King side cost him his living. For a while he accompanied the royal army, and then retired into Wales, where he opened a school at Newton in Carmarthenshire. During the thirteen years of his enforced seclusion, he produced his most memorable works—the *Liberty of Prophesying*, on behalf of the expelled Anglican clergy, in 1647; the *Life of Christ* and the *Holy Living* in 1649; the *Holy Dying* in 1652; and a number of other devotional and controversial books. In 1660, with a dedication to Charles II., appeared his *Ductor Dubitantium, or the Rule of Conscience in All Her General Measures*, the most learned, subtle, and curious of all his works. Promotion was a matter of course to one who was at once a stanch royalist, a profound theologian, and a consummate writer; and before the year was out he was made Bishop of Down and Connor. He was not happy in his Irish see, from which he prayed to be delivered as from 'a place of torment.' The Scotch Presbyterian ministers who had occupied the livings under the Commonwealth disputed his belief in the invalidity of their ordination, and were only ejected with difficulty. He remained at his post, however, until his death. Taylor, sometimes styled the English Chrysostom on account of his golden eloquence, has few equals for richness of fancy. His inexhaustible imagery, full of tender beauty, touched with the characteristic melancholy of the age, reminds us of Shakespeare and Spenser and Fletcher rather than of a sober theologian. With Sir Thomas Browne, he is the best representative of the ornate and florid prose of the seventeenth century. His style is perhaps seen at its best in his sermons, though his *Holy Living* and *Holy Dying*, for their deep and practical piety, have been popular devotional manuals for each generation since his time. The best complete edition of his works is that by Eden in ten vols. (London, 1847-52), with a memoir by Bishop Heber, revised by the editor. Consult also the essay by Dowden, in *Puritan and Anglican* (London, 1900).

TAYLOR, John (1580-1653). An English writer, styled by himself the 'King's water poet.' He was born at Gloucester. After studying there at the grammar-school, he was apprenticed to a London waterman. Pressed into the navy, he served under Essex at Cadiz (1596), and, according to his own statements, he made many voyages in the Queen's ships. Retiring from the navy with a lame leg, he became a famous waterman on the Thames. He frequently superintended the river pageants. As trade waned, owing largely to the fashion for coaches, he began writing doggerel, which attracted great attention and secured him the patronage of men of letters. He also made many tours, which furnished him with material for amusing sketches. On the outbreak of the Civil War (1642) he went to Oxford, where he opened a public house. Returning to London (1645), he took the Crown Tavern in Long Acre. There he died. Though Taylor cannot be taken seriously as a poet, his work is interesting as a picture of contemporary manners. Of his separate publications, numbering about 150, may be mentioned the *Penniless Pilgrimage* (1618), an account of a trip to Scotland; *Laugh and Be Fat* (1613), a burlesque of Thomas Coryate's *Odcombian Banquet; Praise of Hempseed* (1620), an account of a voyage from London to Queensborough, in Kent, in a brown-paper boat; and *Travels in Germanie* (1617). In 1630 Taylor brought out an edition of his writings under the title, *All the Works of John Taylor, the Water Poet, being 63 in number.* This folio was reprinted by the Spenser Society (three parts, London, 1868-69). Other pamphlets not contained in the edition of 1630 were also reprinted by the same society (five parts, 1870-78). For a selection consult his *Early Prose and Poetical Works* (London, 1888).

TAYLOR, John (1750-1824). An American legislator and writer, born in Orange County, Va. He graduated at William and Mary College in 1770, and was a member of the United States Senate from 1792 until 1794, for two months in 1803, and from 1822 until his death. In 1798 he moved in the House of Delegates the famous

"Virginia Resolutions." (See Virginia and Kentucky Resolutions.) He published: *An Inquiry into the Principles and Policy of the Government of the United States* (1814); *Aratos; being a Series of Agricultural Essays, Practical and Political* (6th ed. 1818); *Construction Construed and the Constitution Vindicated* (1820); *Tyranny Unmasked* (1822); and *New Views of the Constitution of the United States* (1822). In his political works he was an ardent advocate of strict construction of the Constitution.

TAYLOR, John (1808-87). The successor of Brigham Young (q.v.) as President of the Church of Jesus Christ of Latter-Day Saints. (See Mormons.) He was born in England, became a Methodist local preacher, and emigrated to Canada in 1829. In 1836, under the ministration of Parley P. Pratt, he joined the Mormon Church and was elected one of the Twelve Apostles. At the assassination of the Prophet Joseph Smith, Jr. (q.v.), he was himself wounded, but was one of those who counseled the Mormons to keep the peace. Opposing the claims of Sidney Rigdon (q.v.) to the headship of the Church, he started with the first emigrants for the Salt Lake Valley. Appointed in 1849 to the European mission, he published a Mormon monthly in Paris and translated the *Book of Mormon* into French and German. Returning to America in 1854, he was stationed in New York as superintendent over the Eastern churches and there published the *Mormon*. Having served as associate justice of the inchoate State of Deseret, as a probate judge of Utah County, and a member of the Utah Legislature, in 1858 he was indicted for treason against the United States Government. On October 6, 1880, he was elected President of the Church.

TAYLOR, John Louis (1769-1829). An American jurist, born in London, England. He removed to Fayetteville, N. C., and was admitted to the bar. From 1792 to 1794 he was a member of the State Legislature, in 1798 was elected a judge of the Superior Court, and was Chief Justice of the Supreme Court from 1810 until his death. In 1817 he was appointed a commissioner for the revision of State statutes, the work being published in 1821. His publications include: *The North Carolina Law Repository* (1814-16); *Term Reports* (1818); and *On the Duties of Executors and Administrators* (1825).

TAYLOR, Joseph (1586?-1653?). An English actor, mentioned in the Shakespeare folio of 1623 as one of those who appeared in Shakespeare's plays. His Hamlet, which he acted after Burbage, is interesting on account of the tradition that Shakespeare himself trained him in the part. At different times he was a member of the company at the Globe Theatre and elsewhere, and later in life he was appointed to the Government office of Yeoman of the Revels. Consult Collier, *Memoirs of the Principal Actors in the Plays of Shakespeare* (London, 1846).

TAYLOR, Nathaniel William (1786-1858). An American Congregational theologian. He was born at New Milford, Conn.; graduated at Yale College in 1807. He studied theology five years with Dr. Dwight and was ordained pastor of the First Church (Congregational), New Haven, in 1812, as successor of Moses Stuart. In 1822 he was elected Dwight professor of didactic theology in Yale College, and held the position till his death. In 1828 he preached in New Haven the *concio ad clerum*, presenting views on native depravity which were denounced as heretical, and led to a protracted discussion between him and Dr. Tyler. The controversy attracted much attention in New England and elsewhere. After Dr. Taylor's death, four volumes of his works were edited by President Noah Porter: *Practical Sermons* (1858); *Lectures on the Moral Government of God* (1858); *Essays, Lectures, etc., upon Select Topics in Revealed Theology* (1859). His *Life* was published at New Haven in 1858.

TAYLOR, Philip Meadows (1808-76). An Anglo-Indian officer and novelist. He was born in Liverpool, England, and when fifteen years old went to India to enter a commercial firm in Bombay, but instead received a commission in the Nizam of Hyderabad's army. In 1841 he was commissioned to pacify the State of Shorapore and was appointed administrator during the minority of the ruler, a task that he accomplished with satisfaction both to the natives and to the British Government. After the Raja's accession he was appointed administrator of the ceded districts in the Western Deccan, his rule during the perilous time of the Mutiny being eminently successful. He returned to England in 1860 and in 1869 was made a companion of the Star of India. Besides his brilliant administrative services Taylor was widely known by his popular novels illustrative of stirring periods in the history of India; the chief of them are: *The Confessions of a Thug* (1839); *Tippoo Sultaun, a Tale of the Mysore War* (1840); *Tara, a Mahratta Tale* (1863); *Seeta* (1872); and *A Noble Queen* (1878), the last two descriptive of the Indian Mutiny. Consult his autobiographical *Story of My Life* (London, 1877).

TAYLOR, Richard (1826-79). A Confederate soldier, familiarly known as 'Dick' Taylor. He was the son of President Zachary Taylor, and was born at New Orleans. He graduated at Yale in 1845, and was for a time with his father in the Mexican War. He was a member of the Louisiana seceding convention, and later became colonel of the Ninth Louisiana regiment. He was soon promoted to the rank of brigadier-general; fought under Stonewall Jackson in the Shenandoah Valley campaign, and then in the Seven Days' Battles before Richmond; was promoted to the rank of major-general, and was put in command of Louisiana, the western part of which he recovered for the Confederacy. On April 8, 1864, he defeated General Banks at Sabine Cross Roads, and captured 22 guns and about 2500 prisoners, thereby making it necessary for the Federal general to give up the Red River Expedition and to retreat. On the following day, however, Taylor himself sustained a severe repulse at Pleasant Hill. On May 4, 1865, he surrendered to General Canby. He published *Destruction and Reconstruction* (1879).

TAYLOR, Rowland (?-1555). An English martyr. He was born at Rothbury, Northumberland, and was educated at Cambridge, where he became principal of Borden Hastel about 1531. He was associated with Cranmer as domestic chaplain, and received in succession numerous ecclesiastical appointments. At Cambridge he had become acquainted with the Protestant manual *Unio Dissidentium* and was a firm believer in, and adherent to, its doctrines. As rector of the living of Hadleigh, Suffolk, to which he had been presented by Cranmer in 1544, he opposed the performance of mass by a priest in 1554, was imprisoned by order of Queen Mary, condemned to death, and on February 9, 1555, was burnt on Aldham Common, near Hadleigh.

TAYLOR, Samuel Coleridge. See Coleridge-Taylor, Samuel.

TAYLOR, Thomas (1758-1835). An English classic scholar known as 'the Platonist.' He was born of humble parents in London. He studied at Saint Paul's School, taught school, and at length obtained a clerkship in a London bank. His spare time he gave to the study of chemistry, mathematics, and especially Greek philosophy; and soon after 1780 he began his lectures on Plato, Plotinus, and the Neo-Platonists. Twelve of them were delivered at the house of Flaxman, the sculptor. On receiving an annuity of £100 from a friend, he resigned his place in the bank and began translating and expounding the ancient classical authors, a work for which he was ill equipped. Among his translations are: *Plato* (1804); *Aristotle* (1806-12); the *Orphic Hymns* (1787); *Apuleius; Celsus; Iamblicus; Julian; Maximus Tyrius; Pausanias; Plotinus; Porphyry;* and *Proclus.* Among his miscellanies are: *Vindication of the Rights of Brutes* (1792); *The Eleusinian and Bacchic Mysteries* (1790); and *Theoretic Arithmetic* (1816). Taylor enjoyed the friendship of Peacock, Romney, and Langton. He died at Walworth, London. He figures as a character in Isaac D'Israeli's novel *Vaurien.* Consult W. E. A. Axon, *Thomas Taylor, the Platonist* (London, 1890).

TAYLOR, Thomas Glanville (1804-48). An English astronomer, born at Ashburton, Devonshire. In 1830 he became director of the East India Company's observatory at Madras, where he collected valuable meteorological and magnetic data, and determined the longitude of Madras. His observations are the first satisfactorily accurate ones made within the tropics. He published the valuable *Madras General Catalogue* (1844), containing the places of 11,015 stars.

TAYLOR, Sir Thomas Wardlaw (1833—). A Canadian lawyer and judge, born in Auchtermuchty, Scotland. He studied at Edinburgh University, and was admitted to the Upper Canadian bar in 1858. From 1872 to 1883 he was Master of Chancery, and from 1883 to 1887 puisne judge of the Manitoba Court of Queen's Bench. In 1887-99 he was Chief Justice of Manitoba, and in 1890 and 1893 was administrator of the provincial government. He made extensive study of equity jurisprudence, on which subject he published a volume of *Commentaries* (1875). His further works include *Chancery Statutes and Orders* and *The Public Statutes Relating to the Presbyterian Church.*

TAYLOR, Tom (1817-80). An English playwright and journalist, and editor of *Punch,* born at Bishop-Wearmouth, near Sunderland. After attending the University of Glasgow he entered Trinity College, Cambridge, where he was elected fellow of his college (1842). He tutored at Cambridge for two years and was then appointed professor of English literature in London University. He also studied law at the Inner Temple, where he was called to the bar in 1846. On the creation of the Board of Health in 1850, he became its assistant secretary and afterwards its secretary. He began early to write for various London periodicals, but chiefly for *Punch,* of which he became editor in 1874. Much interested in art, he wrote biographies of Benjamin Robert Haydon (1853), and of Sir Joshua Reynolds (1865), and edited *Charles Robert Leslie's Autobiographical Recollections* (1860) and *Pen Sketches by a Vanished Hand* (1879), a collection of essays by Mortimer Collins. He also wrote or adapted more than a hundred dramatic pieces. In them he showed himself a great master of stage craft. Among the most popular were: *Still Waters Run Deep* (1855); *The Overland Route* (1860); *'Twixt Axe and Crown* (1870); *The Ticket-of-Leave Man* (1870); and *Lady Clancarty* (1874). In *Masks and Faces* (performed in 1852) he collaborated with Charles Reade.

TAYLOR, William (1765-1836). An English philologian, known sometimes as William Taylor of Norwich. He was born in Norwich, England. He became an enthusiast for the literature of Germany, and devoted most of his life to making it known to his countrymen. His finest production was a translation of Bürger's *Lenora* in ballad metre (completed 1870; published 1796), which led to Scott's version. He also translated Lessing's *Nathan the Wise* (1791), Goethe's *Iphigenia* (1793), and some of Wieland's *Dialogues of the Gods* (1795). By this time he was writing on German literature extensively for the reviews. These articles were collected under the title *Historic Survey of German Poetry* (1828-30). Though interesting for his many eccentricities, Taylor has a place in literary history as the first interpreter of German literature for England. He died at Norwich. Consult: the *Memoir* by Robberds (London, 1843); and Herzfeld's valuable monograph, *William Taylor von Norwich* (Halle, 1897).

TAYLOR, William (1821-1902). A missionary bishop of the Methodist Episcopal Church. He was born in Rockbridge, Va., and entered the Baltimore Conference in 1843. He was missionary to California (1849), and organized the first Methodist church in San Francisco. He was an evangelist 1856-61, and left America, visiting England, Ireland, and Palestine in 1862. He was evangelist in Australia (1863-66); South Africa (1866); West Indies (1867); Australia (1869-70); Ceylon (1870-76), establishing the South India Conference on a self-supporting basis; and South America (1877-83), with brief intervals in the United States. He was elected Missionary Bishop of Africa in 1884, and retired in 1896. He wrote the following works: *Seven Years' Street Preaching in San Francisco* (1857); *The Model Preacher* (1859); *Christian Adventures in South Africa* (1867); *Reconciliation, or How to Be Saved* (1867); *Election of Grace* (1875); *Infancy and Manhood of Christian Life* (1875); *Four Years' Campaign in India* (1875); *Our South American Cousins* (1878); *Self-Supporting Missions in India* (1882); *The Story of My Life* (1895); *Flaming Torch in Darkest Africa* (1898).

TAYLOR, William Mackergo (1829-95). A Congregational minister. He was born at Kilmarnock, Ayrshire; graduated at the University of Glasgow (1849); and at the divinity hall of the United Presbyterian Church, Edinburgh (1852). He was ordained pastor of the United Presbyterian Church at Kilmaurs (1853); pastor of the United Presbyterian Church at Derby Road, Liverpool (1855); pastor of the Broadway Tabernacle (Congregational), New York (1872), and so continued till 1893, when he retired in consequence of a paralytic stroke. Besides biographies of Rev. Matthew Dickie (1872) and of John Knox (1885), he published numerous volumes of sermons and discourses, of which those of a biographical character on Joseph, Moses, David, Elijah, Daniel, Paul, were very popular. He delivered the Lyman Beecher lectures at Yale in 1876, *The Ministry of the Word;* the L. P. Stone lectures at Princeton, *The Gospel Miracles in Their Relation to Christ and Christianity* (1880); also published *The Scottish Pulpit from the Reformation to the Present Day* (1887). A brief memoir appeared in New York in 1895.

TAYLOR, ZACHARY (1784-1850). The twelfth President of the United States. He was born in Orange County, Va., on November 24, 1784, and was the son of Col. Richard Taylor, an officer of the Revolutionary War and one of the first settlers of Louisville, Ky., whither Zachary was taken in early childhood, and where he lived until his twenty-fourth year, working on a plantation and receiving only an elementary education. His elder brother, who had received a lieutenancy in the army, died in 1808, when Taylor was appointed to the vacant commission. In 1810 he was promoted to a captaincy; and in 1812, with 50 men, two-thirds of whom were ill of fever, he defended Fort Harrison, on the Wabash, against a large force of Indians led by Tecumseh. Promoted to the rank of major for his gallantry, he was employed during the war in fighting the Indian allies of Great Britain. In 1822 he built Fort Jesup; in 1832 he served as colonel in the Black Hawk War; and in 1836 was ordered to Florida, where he gained an important victory over the Seminole Indians at Okeechobee, for which he was appointed brigadier-general, and was made commander of the United States forces in Florida. In 1840, having been appointed to the command of the Southwestern Department, he purchased a plantation near Baton Rouge, La. On February 28, 1845, Congress passed the resolution for the annexation of Texas, formerly a province of Mexico, and for some time an independent republic. Texas claimed the Rio Grande for her southwestern boundary; Mexico insisted that there could be no claim beyond the Nueces, and prepared to defend the disputed territory, even if she could not reconquer the whole of Texas. General Taylor was ordered to Corpus Christi. This point he occupied in November with a small force which was increased by reenforcements to 4000 men. On March 28, 1846, he had moved to the Rio Grande, across the disputed territory, and had begun to build Fort Brown, opposite and commanding the Mexican port of Matamoros. General Ampudia, the Mexican commander, on April 12th, demanded that he should retire beyond the Nueces, pending negotiations; and on the refusal of General Taylor, his successor, General Arista, crossed the Rio Grande with a force of 6000 men and 10 pieces of artillery. On May 8th he was defeated at Palo Alto by General Taylor, with a force of 2300; and on the next day was driven from a new position at Resaca de la Palma across the Rio Grande. War was declared first by the President, and later by Congress, to exist by the act of Mexico; and 50,000 volunteers were called for. Taylor was made major-general, was reenforced, and ordered to invade Mexico. On September 9th, with 6600 men, he attacked Monterey, which was defended by about 10,000 regular troops. After ten days' siege and three days' hard fighting, it capitulated. General Scott, having been ordered to advance on the City of Mexico by Vera Cruz, withdrew a portion of the troops of General Taylor, leaving him only 5000 volunteers and 500 regulars, chiefly flying artillery, to meet an army of 20,000, commanded by Santa Anna. He took a strong position at Buena Vista, fought a desperate battle, on February 22 and 23, 1847, and won a decisive victory. (See MEXICAN WAR.) This victory, against enormous odds, created the utmost enthusiasm. General Taylor, popularly called 'Old Rough and Ready,' was nominated by the Whigs in 1848 for President of the United States, and was elected, receiving 163 electoral votes, while General Cass, the Democratic candidate, received 127 electoral votes, and Martin Van Buren, the Free Soil candidate, received none. Entering upon the Presidency in 1849, he found a Democratic plurality in Congress, with a small but vigorous Free-Soil Party holding the balance of power, while the most exciting questions connected with the extension of slavery, as the admission of California, the settlement of the boundaries of Texas, the organization of the other newly acquired Mexican territories, etc., were agitating the country, and threatening a disruption. On July 4, 1850, sixteen months after his inauguration, he was attacked with bilious colic, and died on the 9th. Consult Howard, *General Taylor* (New York, 1892), in the "Great Commanders Series." See UNITED STATES.

TAY'LORVILLE. The county-seat of Christian County, Ill., 26 miles southeast of Springfield; on the Wabash and the Baltimore and Ohio Southwestern railroads (Map: Illinois, C 4). It has a public library (Carnegie), and a fine court-house. Taylorville is surrounded by a productive section engaged in farming, stock-raising, and horse-breeding. There are also coal mines in operation near the city. Paper, chemicals, brick, tile, wagons, bags, and agricultural implements constitute the principal manufactures. The government is vested in a mayor, chosen biennially, and a unicameral council. The water-works are owned and operated by the municipality. Taylorville was settled about 1839, and was incorporated in 1882. Population, in 1890, 2829; in 1900, 4248.

TAYRA, or TAIRA (South American name). A plantigrade, weasel-like carnivore of Central and South America (*Galictis barbara*), closely allied to the grisons (q.v.). It is about three feet long, nearly half of this belonging to the bushy tail; dark brown above, yellowish below; preys upon small animals, and often gathers into small bands which hunt in company, usually in the early morning.

TAY'TAY. A pueblo and the chief town of the Province of Paragua, Palawan Island, in the Philippines; situated in the southwestern angle of the bay of the same name in the northeastern part of the island, in latitude 10° 50′ N., longitude 119° 30′ E. The bay of Taytay is about 11 miles long and 6 miles wide, and affords good shelter in the southwest monsoon. There is a fort with walls 30 feet high and accommodations for 700 men. In the neighborhood of the town are large tracts of cultivated ground. A bridle path connects Taytay with the harbor of Malampaya, 4 miles away, on the western coast of the island. Population, about 1750.

TAYUG, tȧ-yōōg′. A town of Luzon, Philippines, in the eastern part of the Province of Pangasinân, situated 28 miles east of Lingayén (Map: Luzon, E 2). Population, in 1887, 9954; now 19,600.

TAZE′WELL, Littleton Waller (1774-1860). An American political leader, born at Williamsburg, Va. He graduated at William and Mary College in 1792; was admitted to the bar in 1796; was a member of Congress in 1801-03; and then devoted himself to the practice of law. From 1824 until 1833 he was a member of the United States Senate. As a member of the Committee on Foreign Relations he wrote the famous report on the Panama mission. He opposed most of the acts of Adams and of Jackson; was an enemy to the policy of protection; denounced nullification, but was not in sympathy with Jackson's method of suppressing it; and attacked the Administration for removing the deposits from the United States Bank. In 1834 he was elected Governor of Virginia, and after serving his term withdrew from public life. His principal published work is *Review of the Negotiations Between the United States and Great Britain Respecting the Commerce of the Two Countries* (1829).

TCHAD. A lake of Central Africa. See Chad.

TCHAIKOVSKI, chī-kôf′skĭ. See Tschaikowsky.

TCHEKHOFF, chĕĸ′ôf, Anton Pavlovitch (1860—). A Russian novelist, born of former serfs at Taganrog (Southern Russia). In 1884 he received the degree of M.D. at Moscow, but never practiced medicine, as his literary career (begun in 1879 in humorous periodicals) held out promise of great success. His collected *Humorous Stories* and *In Twilight* (1887) and *Morose Folks* (1890) attracted general attention, and from that time his reputation increased rapidly, until at present he occupies with Gorky the front rank of the younger Russian writers. The latest edition of his works appeared in eleven volumes (Saint Petersburg, 1900). The *Memoirs of a Stranger, Fires, Ward No. 6, A Tedious Story,* and *Steppe* are the best of his longer works. The general tenor of all his works, bristling with sallies of humor, stinging wit, and often verging on caricature or the farcical, is pessimistic anger. But in all his writings the native humor is so pronounced that they are read by all classes with the greatest avidity.

TCHELYABINSK, chĕl-yȧ-bĭnsk′. An important district town in the Government of Orenburg, Eastern Russia, 363 miles northeast of Orenburg (Map: Russia, K 3). As the western terminus of the Trans-Siberian Railway the town has considerable commercial importance. Population, in 1897, 19,891.

TCHELYUSKIN, chĕl-yōōs′kĭn, Cape. See Severo Cape.

TCHER′EMIS′SES. A Finnish tribe of Eastern Russia, living in the region on the left bank of the middle Volga—Pyatka, Kazan, and the adjoining governments. They number about 250,000. Their average height is 1.61 meters, the cephalic index 79. In general, they have red hair and a full beard of the same color; their eyes are sunken and of blue, greenish, or chestnut shade; the complexion is fair and freckled, the cheek bones prominent, the face and lips thin, the chin round, and the nose straight. Some authorities believe that they received through the Bulgarians the Tatar influences displayed in their social life, their houses, costumes, social organization, and religious ideas. They believe in evil and good gods, the former called 'Yo' and the latter 'Yurnon Bairan,' and there is evidence that they believe in life after death and in spirits. While the corn blossoms they will not work, and at the end of the period they sacrifice cows, sheep, and fowls in a curious ceremony in which they put the head, heart, and liver of the sacrifice in a bowl and offer it up with prayer before the fire. For three days they eat and pray, and at the end of the ceremony throw whatever is not consumed into the fire, which is kept continually burning. They have also many magical rites to ward off the evil influences of the spirits of the wood, river, and snow and to keep the ghosts of the dead in their graves. Consult Smirinov, *Mordves et Tcheremisses* (Paris, 1895).

TCHERKASSY, chĕr-käs′sė. A district town in the Government of Kiev, South Russia, situated on the Dnieper, 126 miles southeast of Kiev (Map: Russia, D 5). It trades in grain, tobacco, and sugar. Population, in 1897, 29,619.

TCHERNAYA, chĕr-nä′yȧ. A small river in the Crimea, Government of Taurida, Southern Russia, flowing into the Black Sea near Sebastopol. On August 16, 1855, the Russians, numbering 74,000 men, who were besieged in Sebastopol, advanced against the Allies, numbering 39,630, and on the banks of the Tchernaya were repulsed with heavy loss.

TCHERNAYEFF, chĕr-nä′yĕf, Mikhail Grigorievitch (1828-98). A Russian general. He fought in the Crimean War and in the Caucasus and went to Turkestan in 1864 as major-general and captured Tashkend. He left the army in 1867, commenced the practice of law at Moscow, and became an ardent advocate of Panslavism (q.v.). In 1876 he received the command of the Servian army on the Morava, and was defeated by the Turks at Alexinatz, October 29th. In 1879 he tried to organize a revolution in Bulgaria and was sent as prisoner to Adrianople and thence brought to Russia. From 1882 to 1884 he was Governor-General of the military department of Tashkent in Turkestan.

TCHERNIGOV, chĕr-nē′gôf. A government in the southwestern part of Russia. Area, 20,233 square miles (Map: Russia, D 4). The surface is level, and in the north marshy. It is watered by the Dnieper and the Desna. The chief occupation is agriculture and the principal products are rye, buckwheat, potatoes, wheat, and tobacco. Stock-raising is also important. There is an abundance of porcelain clay, which is used extensively for the production of porcelain ware; wooden ware is also largely manufactured. There are a number of sugar refineries and distilleries.

Population, in 1897, 2,322,007, consisting largely of Little Russians. Capital, Tchernigov (q.v.).

TCHERNIGOV. The capital of the Government of Tchernigov, Russia, situated on the Desna, 476 miles southwest of Moscow (Map: Russia, D 4). It has two cathedrals dating from the eleventh and the twelfth centuries and remains of an old castle. Population, in 1897, 25,580. Tchernigov rose to political and commercial importance as early as the eleventh century.

TCHERNYSHEFF, chĕr'ni-shĕf', ALEXANDER IVANOVITCH, Prince (1786-1857). A Russian general. He served against the French at Austerlitz and Friedland, and on the side of Napoleon at Aspern and Wagram. He bore an important part in the campaigns of 1813-14; was made a count in 1825 and Minister of War in 1828. Nicholas I. created him a prince in 1841.

TCHERNYSHEVSKI, chĕr'nĭ-shĕf'skê, NIKOLAI GAVRILOVITCH (1828-89). A Russian publicist and author, born at Saratov. He went in 1846 to the Saint Petersburg University, and soon after devoted himself to literary work. In 1862 he was put into prison for his radical views, and there he wrote in 1863 his novel *What's to Be Done?* which became the political gospel of the Nihilists. He was in exile in Siberia until 1883 when he was allowed to settle at Astrakhan, and at his native town in 1889, a few months prior to his death. Tchernyshevski's historical mission lies in shaping the liberal thought of Russia. His works, which include a translation of Mill's *Political Economy,* were published in Switzerland in 1868-70, in 4 volumes. Consult Plekhanoff, *Tchernyshevski* (Stuttgart, 1894).

TCHETCH'EN, or **CHECHEN**. One of the eastern groups of the peoples of the Caucasus, dwelling between the Kabards and Lesghians and numbering about 225,000 (cephalic index, Eastern Tchetchen, 84.5). Tchetchen is the name given them by the Russians; the Georgians call them Kisti, but their native appellation is Nakhtche, or 'people.' They are one of the most primitive peoples of the Caucasus, and in their mountain fastnesses even now resist Russian conquest. Their religion seems to be Islamism imposed upon an earlier crude form of Christianity with a heathen background. By language they rank as an independent stock.

TCHIGORIN, chĭg'ō-rĭn, MICHAEL (1850—). A Russian chess master, born in Saint Petersburg. He was engaged for a time in the Russian civil service, but early became interested in chess, and at the Berlin tournament of 1881 increased his local fame as an expert by following Blackburn and Zukertort in the list of victors. He was defeated by Steinitz at Havana in 1889, although two years afterwards he won two cable matches. In 1892 he made an unsuccessful attempt to win the world's championship. At the Moscow tournament of 1899 he won first prize, divided the first honors in 1900 at the National Russian Tournament, and was third in the International Masters' Tournament held at Monte Carlo in 1901.

TCHIKHATCHEFF, chê'kȧ-chĕf', PETER ALEXANDROVITCH (1808-90). A Russian geologist and traveler. In 1842, with Elie de Beaumont, Heppert, and Verneuil, he investigated the Altai Mountains, the result being *Voyage scientifique dans l'Altaï oriental et les parties adjointes de la frontière de Chine* (1845). An attaché in the Russian Embassy at Constantinople (1845-47), he mastered Turkish, and during 1847-63 traversed Asia Minor, making large geological, paleontological, archæological, zoölogical, and botanical collections. He embodied the results of his studies in *Asie Mineure* (1853-69). Among his other works are *Etudes de géographie et d'histoire naturelle* (1890).

TCHISTOPOL, chês-tŏ'pôl. A district town in the Government of Kazan, Russia, situated on the Kama, 90 miles southeast of Kazan (Map: Russia, H 3). It has flour mills, distilleries, and cotton mills. Population, in 1897, 20,161.

TCHITA, chē'tȧ. The capital of the Territory of Transbaikalia and an important centre of Eastern Siberia, on the Tchita River and the Trans-Siberian Railway, 532 miles by rail east of Irkutsk (Map: Asia, L 3). Population, in 1897, 11,480, largely Buriats.

TCHITCHAGOFF, chê-chä'gôf, PAVEL VASSILIEVITCH (1765-1849). A Russian admiral. He served under his father, Vasili Yakovlevitch (1726-1809), a Russian admiral, and completed his studies in England (1792-93). As head of the Navy under Alexander I. he greatly promoted the efficiency of the service. In 1812 he received an important military command, but failing to prevent Napoleon's recrossing the Beresina he fell into disgrace and left Russia. His *Memoirs* (1886-88) are valuable.

TCHORLU, chôr'lōō. A town of the Vilayet of Rodosto, in European Turkey, on the Tchorlu River, a tributary of the Ergene, 20 miles northeast of Rodosto (Map: Balkan Peninsula, F 4). There are Christian churches and mosques. Wine and fruit are produced; native carpets and woolen cloth are manufactured. Population, about 11,500.

TCHUKTCHI, chōōk'chê, or **CHUKCHI** (from *cháwtcy*, rich in reindeer). A people living in the extreme northeast of Asia, numbering some 15,000. The 'reindeer Tchuktchi' dwell in the interior about the Kolyma River; the 'sea (or fishing) Tchuktchi,' who form the great majority, inhabit the coast of the Arctic from Bear Island to East Cape, while on the Pacific side they have mingled with the Eskimo. They are tall, well built, rather light-skinned, decidedly brachycephalic in part (there seem to be two physical varieties among them), and differ somewhat in form and features from the typical Mongolians, with whom they are allied by speech. Besides an interesting Shamanism, the Tchuktchi have a wealth of folk-lore and mythology not without traces of Eskimo influence. Among them, as among several other savage tribes, the old men commit suicide with great ceremony.

TCHUST, chōōst. A town in the Territory of Ferghana, Russian Turkestan, 110 miles northeast of Khokand (Map: Persia, M 1). The natives manufacture knives and saddles. Population, in 1897, 13,686.

TCHUVASHES, chōō-väsh'ĕz. A people of Eastern Russia, probably of Finnic origin, and now with a strong Tatar admixture. Their seat is near the Volga and they number somewhat over 500,000. Their language, which is distinct, is assigned to the Ural-Altaic stock. They are industrious and orderly, their chief occupations being agriculture and cattle-breeding. The Tchuvashes are nominally Christians, but more primitive Shamanistic beliefs and practices are still prevalent among them. Consult Schott, *De Lingua Tschuwaschorum* (Berlin, 1841).

TEA (from Fuhkien Chin. *te*, Chin. *ts'a*, *ch'a*, tea), *Camellia Thea*, or *Thea Sinensis*. A shrub, the dried leaves of which are one of the most important articles of commerce, and yield one of the most esteemed and extensively used of all non-alcoholic beverages. The tea shrub, which is a native of subtropical Asia, but is grown in tropical climates also, is 20 to 30 feet high, but under cultivation only three to six feet high, with numerous branches and lanceolate leaves, two to six inches long. The flowers are axillary, rather large, white, and fragrant. Numerous varieties have been produced in China, where tea is grown chiefly on the southern slopes of hills in the regions between latitudes 24° to 35° N., and longitudes 115° to 122° E. A new plantation is made by sowing two or three seeds at proper distances. The first crop is obtained in the third year, when the shrub is still small. When about seven years old, it yields only a scanty crop of hard leaves, and is cut down, to induce new shoots to sprout from the root. This is frequently repeated till the plant dies at about thirty years of age.

TEA (*Thea Sinensis*).

History and Commerce. Tea appears to have been used for ages in China, where it is believed by the natives to be indigenous. At the end of the sixteenth century it is mentioned by Maffei, a Portuguese writer, in his *Historiæ Indicæ*, as a product both of China and Japan. On June 27, 1615, a Mr. Wickham wrote the first English record of it. His letter is among the documents of the East India Company. From this time it became gradually known to the wealthy citizens of London, who received presents of small quantities from China via India, or by small, exorbitantly dear lots in the markets—sometimes as much as £10 a pound. In 1657 a rather large consignment was received by Thomas Garraway, a London merchant, who established a house for selling the prepared beverage.

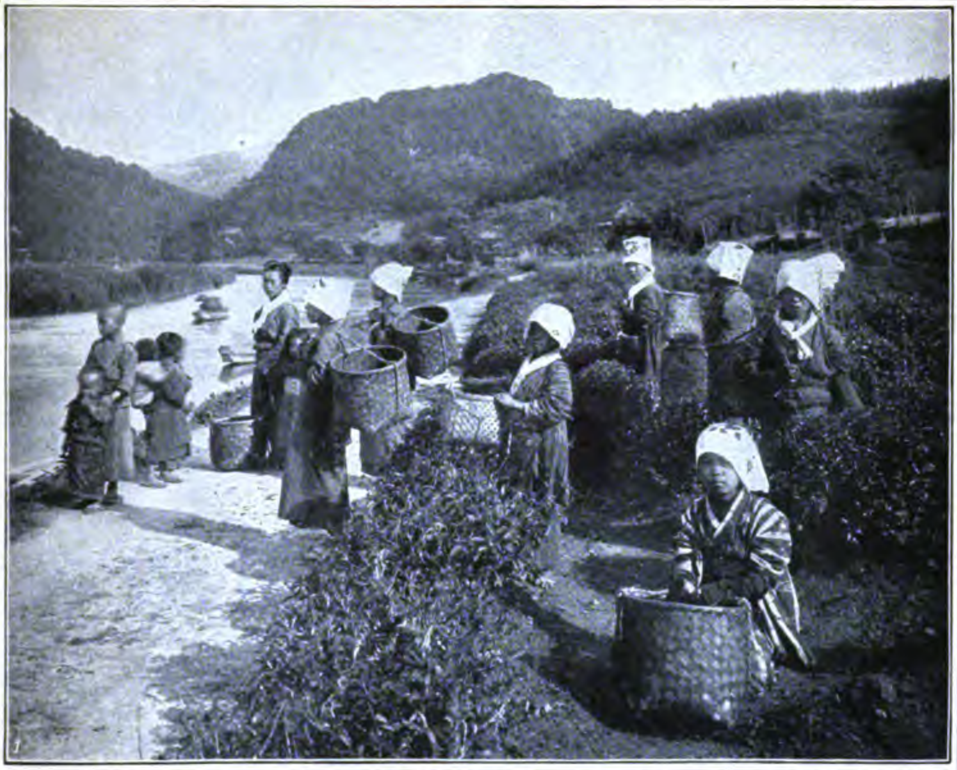
The tea-farms of China are usually small, and require careful cultivation and much attention; for the plant will thrive only in well-manured or very rich soil. Although an evergreen, the leaves are useful only at certain seasons. Some of the new leaves, which appear in April, are made into young hyson of such fine quality that it has rarely been used for distant export because it is said to lose flavor by the sea-voyage. Much is, however, sent overland to Russia, where it commands an exorbitant price. The ordinary picking begins in May; and later in the season, a third picking of an inferior, more bitter woody grade is obtained and sold mainly to poor people. The odor and flavor of dried tea are developed by the oxidation which the leaves undergo in the process of drying. Moreover, different qualities and colors are prepared from the same leaves, which may also be roasted and scorched to produce the different varieties distinguished by odor and taste. For *green teas* the leaves are roasted in pans for about five minutes almost immediately after they are gathered. After being rolled with the hands upon a table they are returned to the pans, and kept in motion by the hands for about an hour. They are then dull green, but become brighter afterwards. For *black teas*, they are spread and tossed in the air till they become flaccid; they are then roasted for a few minutes, rolled, exposed to the air for a few hours while soft and moist, and lastly dried slowly over charcoal fires, till they become almost black. Hence their dark color and distinguishing flavor seem due to the long exposure to the atmosphere in the process of drying, and the oxidation of certain inherent ferments acting rapidly upon the juices of the leaf, and especially upon the astringent principle during this exposure. For the purpose of giving special odors to different varieties of tea, numerous odoriferous plants are employed in differents parts of China, the blossoms of the sweet-scented olive (*Osmanthus fragrans*) being frequently used. In China spurious teas have been prepared and exported under the name of 'lie teas,' but they have not been popular. The Chinese color ('face') the export green teas with Prussian blue, turmeric, etc., to please the eye. Facing is not regarded as adulteration, which is unlawful in the United States.

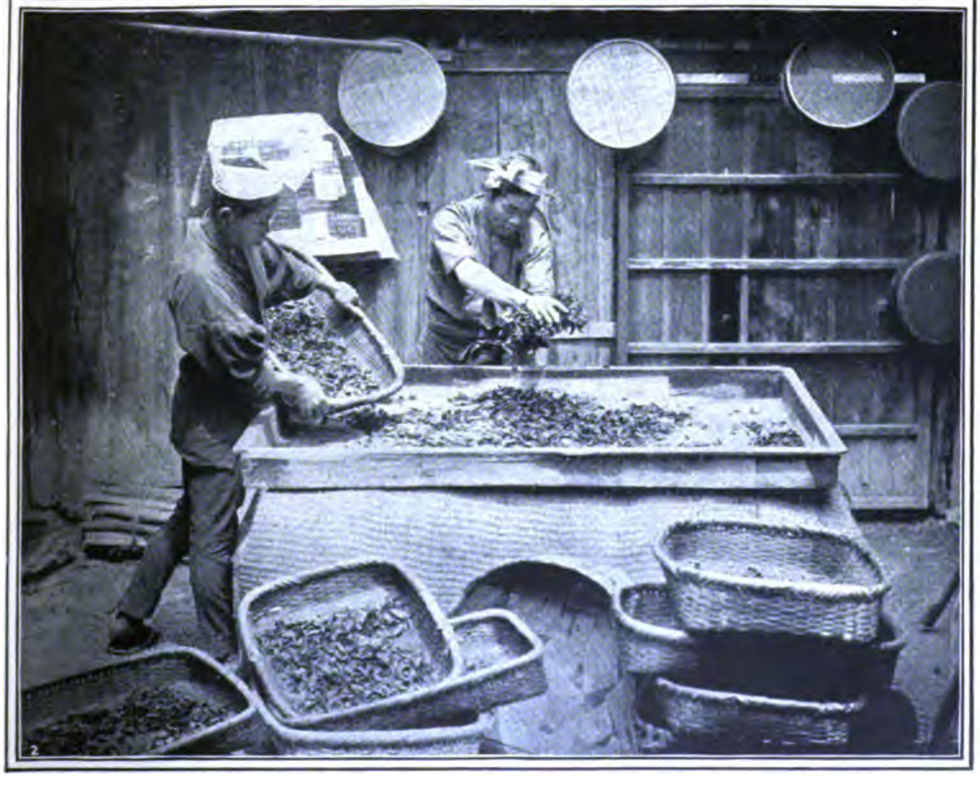
In 1836, after some difficulty in obtaining plants, the culture of tea was attempted on a large scale in India. Plantations had been formed at an earlier period in Assam and had made great progress. In Ceylon the culture of tea has extended. Large quantities are also produced in Java, the industry being carried on by wealthy companies. The growth of this plant has been attempted in South Carolina, with considerable success, and experiments are being made in several other Southern States.

Among the numerous varieties of tea used in the United States are the following: Green. *Chinese.*—(1) Gunpowder sorts—Shanghai, Pingsuey Moyune, Imperial Moyune, and Canton; (2) Hyson sorts—Shanghai, Shanghai young, Moyune, Moyune young, Canton young, and Twankay or Imperial Hyson. *Japanese*—Gunpowder and young Hyson. *Java*—Gunpowder. Black. *Chinese.*—(1) Conjou sorts—Canton Foo-chow-foo, Hung-muey, Oopack Kaison, and Oonam; (2) Pekoe sorts—plain orange Foo-chow, scented orange, Canton scented orange and flowery Pekoe, Oolong, and Souchong. *Assam*—Conjou orange Pekoe, and Souchong. *Java*—Conjou and, rarely, Imperial.

The use of teas as a beverage is general in

TEA





1. THE LAST PICKING. 2. DRYING THE LEAVES IN A TEA-HEATER.

Southeastern Asia, and has become prevalent among the British, the Russians, and the Dutch. Among other European peoples its use is much less general, and is chiefly confined to maritime districts, towns, and the wealthy.

Where tea is difficult to obtain substitutes of two sorts are used: those, such as Maté, guarana (qq.v.), coffee leaves and kolanut, which contain theine or caffein (q.v.), and which consequently have the stimulating effect; and those, such as Siberian tea (*Saxifraga crassifolia*), Appalachian tea (*Viburnum cassinoides*), Labrador tea (*Leiophyllum buxifolium*), Chilean tea (*Myrtus Ugni*), Trinidad pimento tea (*Pimenta officinalis*), which resemble the true tea in flavor or smell, or which possess some other stimulating principle. See Plate of Beverage Plants.

TEACH, or THATCH, Edward (?-1718). An Anglo-American pirate, popularly known as Blackbeard. Probably he was born at Bristol, England, and in his youth went to the West Indies. He became widely known and feared for his robberies and atrocities, throughout the West Indies and along the coast of Carolina and Virginia. For winter quarters he built himself a house which is still standing, on the upper bank of the Pasquotank, N. C., accessible only from the Sound. There on November 22, 1718, he was attacked by two small sloops under the command of Lieutenant Maynard of the British Navy, and by a successful ruse led to board the vessels, when he with several of his men was killed, and of the 15 prisoners taken, 13 were subsequently hanged. His *Life* is included in Charles Johnson's *Lives of the Pyrates* (1724), and he appears in Howard Pyle's *Jack Ballister's Fortunes* (1894).

TEACHERS COLLEGE. An institution in New York City for the training of teachers and school administrators, founded in 1888, and made a part of the educational system of Columbia University (q.v.) in 1898, taking academic rank with the schools of law, medicine, and applied science. The college is represented in the Columbia University Council by its dean and an elected representative of the faculty, but maintains its separate corporate organization, with a board of trustees who assume the entire financial responsibility for its maintenance. The departments of instruction are history and philosophy of education, educational administration, educational psychology, elementary and secondary education, English, French, and German, Greek and Latin, history, biology, geography, physics and chemistry, mathematics, kindergarten, fine arts, domestic art, domestic science, manual training, music and voice training, and physical education. No department undertakes work for which adequate provision is made in other faculties of the university. The college maintains two schools of observation and practice: the Horace Mann School, with kindergarten, elementary and high-school departments, and the Speyer School, consisting of a kindergarten, an elementary school, and special classes in sewing, cooking, and manual training. The large demand for university extension work in 1902-03, when 45 courses were given, led to the establishment of an extension department, beginning in September, 1903. The buildings, five in number, were valued in 1903 at $2,000,000, when the endowment was $190,000, and the gross income $230,000. The total registration was 3018, including 729 collegiate students, 1093 in the Teachers College schools, and 1196 extension students. The Bryson Library contains 22,000 volumes.

TEACHING OF THE TWELVE APOSTLES (Gk. *διδαχὴ τῶν δώδεκα ἀποστόλων*, *didachē tōn dōdeka apostolōn*), also called the Didache. An ancient Christian document, written in Greek, probably before 150, of great value for the study of organization, belief, and worship in the early Church. It was found in 1873 by Bryennios (q.v.), Metropolitan of Nicomedia, in an eleventh-century manuscript in the Monastery of the Holy Sepulchre in Constantinople, and was published by him ten years later. Modern editors include it, by general consent, among the Apostolic Fathers (q.v.). The *Teaching* was apparently compiled from earlier material, for use as a church manual. It contains a description of the Two Ways, one of life, the other of death, in the form of rules for Christian conduct, somewhat akin to the Decalogue, but longer. Whether or not this part of the *Teaching* was originally separate from the rest, it is evident that it was used in catechetical instruction, to prepare converts for baptism. The second portion of the *Teaching* sets forth the proper observance of the rites of baptism and the Lord's Supper, with directions for their administration, and prayers and forms for use in the same. It further defines the office and duties of the Christian leaders, especially apostles, prophets, teachers, bishops, and deacons. Ceremonial and organization are alike extremely simple. The whole concludes with a paragraph announcing the speedy second coming of Christ and the final judgment.

The *Teaching* was held in high honor in the early Church, falling short, however, of canonicity. It forms the basis of the seventh book of the *Apostolic Constitutions* (q.v.), and bears some literary relationship to the *Shepherd* of Hermes and perhaps to the *Apology* of Aristides. Most critics are inclined to attribute it to Syria or Egypt, but no decisive argument exists for either. By the fourth century the *Teaching* had taken its place definitely among the 'ecclesiastical' as distinguished from the 'canonical' books, and it was thenceforward employed only for edification, not for authoritative teaching in the Church. Consult: Schaff, *The Teaching of the Twelve Apostles* (3d ed., New York, 1889); Harris, *The Teaching of the Apostles* (Baltimore, 1887; contains facsimiles of the manuscript); Cruttwell, *Literary History of Early Christianity* (London, 1893; contains an English translation); Krüger, *History of Early Christian Literature* (New York, 1897). The text will be found critically edited, in Funk, *Patres Apostolici* (2d ed., Tübingen, 1901).

TEAGUE. A faithful and humorous footman in Howard's *Committee*, who gave his name for some time afterwards to many Irishmen in the literature of the later Stuarts. The part, said to have been drawn from a servant of the author's, was most successfully created by the actor Lacy.

TEA INSECTS. The tea plant is attacked by several injurious insects, as the faggot-worm (*Eumeta Carmerii*), one of the bagworms, whose larva carries a case made up of fragments of twigs and feeds upon leaves of the plant. The tea borer (*Zeuzera coffeæ*) is the larva of a cossid moth; it bores into the stems of both coffee and tea plants. Three species of bark-lice (*Aspidiotus theæ, flavescens,* and *transparens*) also occur commonly upon tea, and the first named is one of the most serious enemies of the growing plant, very noticeable at the time of pruning. Three mites feed upon the leaves, one of them a 'red spider' (*Tetranychus bimaculatus*), another the five-legged tea-mite (*Typhlodromus carinatus*), closely related to the rust-mite of the orange. It feeds upon the lower leaves. The yellow tea-mite (*Acarus translucens*) feeds upon the buds and produces the condition called 'sulky.' Consult Watt, *The Pests and Blights of the Tea Plant* (Calcutta, 1898).

STICK-COVERED COCOON OF A FAGGOT-WORM.

TEAK (Malayan *tekka*, Tamil *tekku*, teak-tree). Two kinds of timber, valuable for shipbuilding and other purposes. Indian teak (*Tectona grandis*) belongs to the natural order Verbenaceæ; African teak or African oak (*Oldfieldia Africana*), to the Euphorbiaceæ. The former is found in the mountainous parts of Malabar and other parts of Southeastern Asia. The teak forests of India are mostly under governmental control and yield a considerable revenue. The usual practice is to girdle the trees and allow them to stand for two years to season thoroughly before felling. Teak has been introduced in some parts of India in which it is not indigenous. It is a beautiful tree which rises above all the other trees of the East Indian forests, sometimes attaining a height of 200 feet. Silk and cotton stuffs are dyed purple by the leaves. The timber, which will sink in water unless dry, is one of the most valuable produced in the East; it resembles coarse mahogany, is easily worked, strong, durable, and not liable to the attacks of insects. It is largely used for furniture, some of which is handsomely carved, and for shipbuilding, for which purpose it is exported. The teak generally grows rather in clumps in forests than in forests of itself. African teak is adapted to the same uses as the Indian teak, though it is not quite as durable.

TEAL (connected with Dutch *teling*, teal, brood, *telen*, to breed, and perhaps with AS. *tilian*, Eng. *till*, OHG. *zil*, Ger. *Ziel*, object). One of a group of small beautiful fresh-water ducks, mostly in the genera Nettion and Querquedula. They are migratory, going to the tropics for the winter, and when in the United States are shy and silent, feeding chiefly at night on water-plants, seeds, worms, and insects. They make their nests usually at some distance from water, and lay greenish, or in some species cream-colored, eggs. Species of these two genera are known in all parts of the world. The commonest North American species is the green-winged teal (*Nettion Carolinense*). This fine bird is nearly the same as the 'common' teal (*Nettion crecca*) of the northern parts of the Old World. About a dozen other species are met with in Asia, Africa, and South America, all favorites among gunners and epicures. The blue-winged teal (*Querquedula discors*), represented in Europe by the garganey (q.v.), is very abundant in many parts of North America. It is rather larger than the common teal. The head and neck are blackish with a large white crescent in front of the eye. The wing-coverts are sky-blue and the under parts are purplish gray with black spots. The cinnamon teal (*Querquedula cyanoptera*) is also blue-winged, but the general color is rich purplish chestnut and there is no white on the head. This is a South American duck, which is also common west of the Rocky Mountains as far north as Oregon. Two other species belong to South America. Consult authorities and Plate under DUCK.

TEANO, tâ-ä'nô. A city in the Province of Caserta, Italy, 42 miles north-northwest of Naples, at the foot of the extinct volcano Rocca Monfina. It was one of the leading cities of Campania. The present town is interesting for its old ruins, among them a castle. Population (commune), in 1901, 13,326.

TEARSHEET, DOLL. A vicious and vigorous female character in the second part of Shakespeare's *Henry IV.*

TEARS OF THE MUSES. A poem by Edmund Spenser, published in 1591, by Ponsonby. It is a discussion of the mediocrity of the literature of the day, and is put into the mouths of the various muses, who thus deplore the decay of their power. Its source is a Latin poem by Harvey (1588). In the *Midsummer Night's Dream*, V. i., Shakespeare describes the work as 'a piece sharp and satirical.'

TEASEL (AS. *tæsel*, *tæsl*, OHG. *zeisala*, teasel, from AS. *tæsan*, Bavarian Ger. *zaisen*, to tease wool), *Dipsacus*. A genus of plants of the natural order Dipsacaceæ. The only valuable species is the fuller's or clothier's teasel (*Dipsacus fullonum*), a native of Southern Europe, naturalized in the United States. It is a biennial, several feet high, with sessile serrated leaves, prickly stems and leaves; and with cylindrical heads of pale or white flowers, between

TEASEL (*Dipsacus sylvestris*).

which are oblong, hook-pointed, acuminated, rigid bracts. The plant is cultivated for the heads, which are cut off when in flower, and are used for raising the nap of cloth, a purpose for which no mechanical contrivance has been found to equal them. The split heads are fixed on the circumference of a cylinder, which is made to revolve against the surface of the cloth. The wild teasel (*Dipsacus sylvestris*), from which fuller's teasel is supposed to have originated, has straight instead of hooked prickles on the heads. It is a common and troublesome weed in some parts of the United States.

TEA TREE. See CAJEPUT.

TEA-WATER PUMP. A spring famous in New York during the eighteenth and part of the nineteenth century. It was situated north of the present City Hall Park, on Chatham Street, and was for a long time the chief source of supply for drinking purposes, owing to the purity of its water.

TEAZLE, tē'z'l, LADY. A sprightly country-bred girl who is married to an elderly and exacting but kind-hearted old gentleman, in Sheridan's *School for Scandal*. She falls in with a set of society gossips and her head is turned by the keenness of their acid speech. She is courted by the hypocritical friend of her husband, Joseph Surface. The rôle was created by Mrs. Abingdon.

TEAZLE, Sir PETER. The husband of Lady Teazle (q.v.). The rôle was created by Mr. King.

TECHE, tĕsh. A bayou in Louisiana (Map: Louisiana, D 3). It leaves the Red River near Alexandria and flows southeast in a course of 175 miles, during which it sends off numerous branches to the Atchafalaya Bayou, and finally empties into that bayou below Grand Lake, sending also several widely separated arms directly to the Gulf of Mexico. It is interesting as having been anciently a main outlet of the Red River, and is lined with high and extensive alluvial banks which form excellent agricultural lands safe from inundations. The bayou is navigable for steamers to Saint Martinsville, about 90 miles.

TECHNICAL EDUCATION (from *technic*, from Gk. *τεχνικός*, *technikos*, relating to art or handicraft, from *τέχνη*, *technē*, art, handicraft, from *τίκτειν*, *tiktein*, to bring forth, produce). The term technical education, strictly speaking, embraces all instruction that has for its object the direct preparation for a career or vocation. In common use, the designation is applied to such instruction as bears directly upon the industrial arts. The field of such education ranges from instruction in the arts and sciences that underlie industrial practice in its broadest and most complex relations to the simple training in manipulation needed for the prosecution of some productive trade. This wide province naturally calls for numerous and widely divergent types of schools.

Technical schools may conveniently be divided into three classes: (1) Institutions of a collegiate or university grade, to which the titles engineering schools, institutes of technology, polytechnic institutes, and schools of applied science are variously given, and which are devoted to instruction in advanced mathematics and science, and the theory and practice of industrial operations. (2) Schools in which the purpose is to prepare for practical work in some particular field of industry and which afford instruction in those branches of science and art that underlie its special problems. This class is represented by schools of weaving, dyeing, building, and machine construction and draughting. The term 'technical school' has been used in a specialized sense in this article to denote institutions of this character. In this class may be grouped schools of industrial art in which the study of design is supplemented by training in manipulation. Evening continuation schools which afford instruction in science, art, and technical methods may also be considered in this group. (3) Trade schools which supply a training in the practice of some productive trade. The function of the first type of school is to educate its students for managers and superintendents of industrial establishments, consulting and designing engineers and architects, etc.—in other words, to supply leaders and organizers for the industrial world; that of the second, to provide foremen, designers, and experts in special lines of industrial practice; and that of the third, to train craftsmen for practical work at a trade.

ENGINEERING SCHOOLS; SCHOOLS OF APPLIED SCIENCE; INSTITUTES OF TECHNOLOGY. The earliest establishment of this type of school occurred in France and Germany. In France, the Ecole des Ponts et Chausées, originally started in 1747 as a drawing school, was organized in 1760 for the training of engineers for the Government service. In 1794 the celebrated Ecole Polytechnique was founded, primarily to fit men for the engineer and artillery corps of the French Army. Not only has this school done much to set the standard of scientific training for the State service, but from the fact that many of its graduates have engaged in private work, it has exerted a strong influence upon general industrial practice. Other special engineering schools have been established at different times by the French Government, and in 1829 the Ecole Centrale des Arts et Métiers was founded as a private institution. The standards of this school have always been of the highest character. In Germany the first institution that approached a modern engineering school was the School of Mines founded at Freiberg in 1824, in order to develop engineers for working the mines in the neighborhood. Later in the century came the great development of pure science in the German universities, and following this came an era of equal activity in the field of applied science, which quickly resulted in the widespread establishment of polytechnics or *Technische Hochschulen*. Rivalry between the various States played a part in the spread of these schools, each striving to outdo the others in magnificence of buildings and completeness of equipment. These institutions, which often had their beginnings in secondary technical or trade schools, have now become foundations coordinate with the universities, requiring equal academic preparation for admission, and representing specialized courses in engineering, architecture, industrial chemistry, and agriculture. Schools of this kind are uniformly supported by the governments of the various States, and present a very highly developed organization. The splendid Technische Hochschule at Charlottenburg, and similar institutions at Munich, Dresden, Darmstadt, and Hanover, are foremost examples of this class. Engineering schools of a high grade are maintained also by the governments of Austria, Italy, Switzerland, Sweden, and Russia. Great Britain awakened more slowly to the need of technical education than other European countries. In 1881 a Royal Commission on Technical Instruction was appointed to investigate the entire subject. Among other results of this awakening was the foundation of the City and Guilds of London Institute, formed by a union of many of the wealthy corporations of the old London guilds. The scope of the Institute activities includes the support and management of three institutions in the city of London, and the direction of a system of examinations dealing with the work of technical classes throughout England and Wales, and represents a system that touches all the important phases of technical instruction with the single exception of the trade school. The most important of the three schools established in London, the Central Institution of the City and Guilds of London Institute, is a well-organized school of technology. The Institute gave £100,000 for buildings and equipment, and annually contributes £10,000 to its support. Courses are provided for training engineers, architects, industrial chemists, and technical teachers. Other schools of an advanced character and several university departments of applied science have come to the front in Great Britain, prominent among which are Owens College (q.v.), Manchester; Mason College, Birmingham; Yorkshire College, Leeds; and Bradford Technical College.

In the United States the development of the school of technology has been exceedingly rapid, and has resulted in a type of institution that in some respects is the superior of anything to be found abroad. The Rensselaer Polytechnic Institute (q.v.), founded in 1824 by Stephen Van Rensselaer as a school of theoretical and applied science, was the first establishment in this field. The work of this school has been almost exclusively devoted to the training of civil engineers. In response to the growing demand for scientific instruction, the Sheffield Scientific School (1847) at Yale and the Lawrence Scientific School (1848) at Harvard were founded. Most of the technical schools, however, date from the later years of the Civil War. In 1861, through the efforts of Prof. William B. Rogers, the charter of the Massachusetts Institute of Technology (q.v.) was granted, and in 1865 the first classes were organized. The Worcester Polytechnic Institute (q.v.) was opened to students in 1867. This was the first school of technology in the United States to provide systematic instruction in workshop practice as an element of the course in mechanical engineering. In 1864 the first courses in the School of Mines, Columbia University, were organized, and from this have developed the several schools of applied science of that institution. In 1871 the Stevens Institute of Technology (q.v.) at Hoboken was opened. The beginnings of the Sibley College of Mechanical Engineering and the Mechanic Arts were made at Cornell University in 1872, and other courses in applied science were soon established there. In the next twenty years a large number of schools of the first rank were founded either as separate institutions or as departments of universities. Notable among those of the first kind are Purdue University (q.v.), Lafayette, Ind.; Rose Polytechnic (q.v.), Terre Haute, Ind.; the Michigan School of Mines, Houghton, Mich.; the Case School of Applied Science (q.v.), Cleveland, Ohio; and the Armour Institute of Technology (q.v.), at Chicago, Ill. Prominent among the second group are the engineering departments of Lehigh University, the Ohio State University, Washington University (Saint Louis), and the universities of Michigan, Wisconsin, Minnesota, Pennsylvania, and California.

The history of these schools has been marked by the development of a number of very significant features of instruction. To begin with, emphasis has from the first been placed upon the laboratory method of instruction, as opposed to sole reliance upon text books. Following the organization of instruction in pure science came that in applied science. Another feature that has characterized the instruction in many of these institutions is the degree of specialization in the instructing staff made possible by the large numbers of students. The courses of study of American schools of technology almost universally extend through four years.

TECHNICAL AND APPLIED ART SCHOOLS; CONTINUATION SCHOOLS. All the types of this group of institutions have reached a high point of organization on the Continent of Europe. Technical schools, in which to practical training in the methods of a special craft is added instruction in the scientific principles upon which they are based, appear in greatest numbers in Austria, Germany, and France. Some have been established by guilds or masters' societies, some by a union of manufacturers of a town or city wishing to improve the efficiency of their establishments, and others by action of the local authorities or by the Government. A steady tendency toward Government control and support is apparent in all the Continental countries. Prominent among schools of this type are the special schools for weaving and dyeing, of which frequent examples are found in various parts of Germany. The most famous institution of the kind is located at Krefeld, in Prussia. In this model institution very thorough study is made of the chemistry and technology of dyeing, and of the mechanism and pattern designing involved in weaving. The Advanced School of Weaving at Lyons, France, the School of Silk Weaving near Zurich, Switzerland, the School of Weaving and Dyeing at Yorkshire College, Leeds, and the textile departments of the Manchester Technical School and of the Bradford Technical College, are other examples of this type of school. In the United States similar schools are the textile and dyeing schools of the School of Industrial Art of the Pennsylvania Museum, at Philadelphia, and the textile schools at Lowell and New Bedford, Mass.

Another type of technical school found in Germany and Austria is the *Baugewerkschule* or building trades school. These schools are generally open during the winter months alone. Only students are admitted who have had practical experience in some branch of the trade, and the courses deal with the principles and practice of building construction, the nature of materials, mechanical and freehand drawing, modeling, science, mathematics, and bookkeeping. The courses generally run through four terms and are strictly professional in character. Many of the *Fachschulen* of Austria, although aiming at trade instruction, might well be classed as technical schools on account of the character and extent of the technical instruction that is offered in addition to the practical work. Another form of technical school is represented by a class of institutions of the secondary grade, which aim to prepare rather for entrance into industrial work than for direct mastery of any one special branch. In these schools the courses commonly include instruction in the elements of a general education, as well as the study of applied science and practical training in a number of representative industrial processes. The *Industrieschulen* and *Gewerbeschulen* of Germany and Austria are examples of this type. Courses in these schools are generally from three to five years in length, and embrace, besides practical industrial work, instruction in mechanical and freehand drawing, geography, business forms, mathematics, bookkeeping, science, and technology. Schools of this kind are found at Chemnitz, Cologne, Komotau, Munich, and Nuremberg. In Austria the School of the Technological Industrial Museum, at Vienna, is the foremost example, and serves as a model for all other schools of this class throughout the Empire.

France has a very important and highly organized system of State schools for the training of foremen and superintendents in mechanical industries at Chalons, Aix, Angers, and Lille. The courses are three years in length. The instruction, both practical and theoretical, given in these schools, has been of so thorough a character that the result in large part has been to train managers and mechanical engineers rather than foremen. Other technical schools of an advanced character in France are the Industrial Institute of the North of France, at Lille, and the Institution Livet, at Nantes, which is a private foundation. A school of a special type exists at Lyons, the Ecole Martinière. Distinct courses are provided for boys and girls. In the former the sciences and arts are studied in their relation to commerce and industry. The object is not to prepare for any special trade, but to develop general capacity for an industrial or commercial career. The course, which lasts for three years, is very similar to those of the American manual training schools. The courses for girls aim to furnish a trade training in commercial accounting, embroidery, industrial drawing, and women's tailoring, together with a general education. The Finsbury Technical College, in London, is the most important institution of this class in England. Several well-equipped schools of this general type exist in other parts of England, among which are the Manchester Technical School, the Birmingham Technical School, and the Sheffield Technical School. In the United States the manual training high schools (see MANUAL TRAINING) approach quite close to this last category of schools, but devote a larger proportion of time to general branches.

Schools of industrial or applied art have also reached their highest point of development on the Continent of Europe. In Austria and Germany the *Kunstgewerbeschule*, often connected with an extensive and admirably filled museum, is found in all the large cities. Courses in drawing, painting, modeling, and design are provided, leading to some special branch of applied art. In some schools, notably those at Munich and Vienna, the handicraft side is prominent and much attention is given to practical work at carving, metal-chasing, stained glass, leather-embossing, fresco painting, embroidery, porcelain-painting, lithography, smithing, and other lines. In France are to be found not only the first schools of painting, sculpture, and architecture in the world, but also the most thoroughly organized provision for instruction in decorative and industrial art. The Government lends liberal support to the art schools, and assists in establishing new ones when the need of such is manifest. Some are supported entirely by the State, and others are assisted through grants. All are under the direction of the Minister of Public Instruction and Fine Art. Excellent schools of applied art are to be found in all parts of France, often with a distinct trend of instruction toward the industries prominent in the locality, as in the case of ceramics at Limoges and textiles at Roubaix. In Paris there are three schools which afford instruction in industrial art—the Ecole Nationale des Arts Décoratifs, the Ecole Germain-Pilon, and the Ecole Bernard-Palissy; the first to teach the principles of design in relation to industrial art as a whole, the last with direct reference to certain trades, with a liberal amount of workshop and laboratory practice. The great schools of the Government Science and Art Department (now under the Board of Education for England and Wales) at South Kensington represent the most important provision for instruction in industrial art in Great Britain. The work of these schools consists largely of drawing, painting, and modeling, and although the application of art to industry is counted as the main purpose of the institution, no practical work is attempted. A large number of smaller schools patterned upon the same model exist in other parts of Great Britain under the guidance and financial assistance of the Science and Art Department.

In the United States schools of applied art are not numerous, and in few cases is a training in the practical application of design attempted. Prominent among the institutions affording instruction in this field are the Cooper Union (q.v.), of New York City; the School of Industrial Art of the Pennsylvania Museum; Pratt Institute (q.v.), Brooklyn, N. Y.; Drexel Institute (q.v.), Philadelphia; the Maryland Institute, Baltimore; the Art Academy, Cincinnati; the Chicago Art Institute; the Rhode Island School of Design, Providence; and the Lowell School of Design, Boston.

Evening classes in science, drawing, design, and technical studies may well be considered in this second general group of schools. The *Fortbildungsschulen* of Germany and Austria are both day schools and evening schools. Many communities make attendance upon such schools compulsory for both boys and girls between fourteen and seventeen years old, and such attendance is often a condition of employment. Freehand and mechanical drawing, and special instruction relating to the trades of the locality, are the principal subjects taught in such schools. In Vienna every prominent trade is represented by a special Fortbildungsschule, and Berlin supports a great number and variety of similar schools. Evening industrial schools play an important part in the thickly populated manufacturing centres of Belgium, where, in such towns as Liège, Brussels, and Seraing, thousands of workmen nightly receive scientific and technical instruction bearing on their trades. There are many technical schools in Paris and other cities and towns of France that provide evening instruction. In most cases such evening classes are supported by commercial or industrial societies and bear upon the local industries.

Nowhere else is the organization of evening industrial classes carried to so high a point as in Great Britain. Through the system of examinations and grants directed by the Science and Art Department, classes in drawing, modeling, design, mathematics, and many branches of science, are maintained throughout the United Kingdom. From 1879 to 1890 the City and Guilds of London Institute performed a similar function for technical and industrial classes. By their liberal financial assistance through examination grants, not only were all manner of technical courses organized throughout the country, but practical trade classes were opened to broaden and further the experience of those engaged in the trades. The act of 1889 which authorized local authorities to build and maintain technical schools, and to contribute to evening technical classes out of the local rates, followed by the law of 1890 which set aside a portion of the excise duties for the support of such schools, rendered the financial assistance of the Institute no longer essential, and since 1890 that association has confined its grants to classes in the city of London. The Institute continues its functions as an examining body, and is recognized as setting the standard for all work in this field.

In the United States such evening schools are rapidly assuming an important place. The free evening classes of the Cooper Union have provided an opportunity for thousands of young men to advance themselves. The evening classes of the Pratt Institute, Brooklyn, N. Y., represent an important and highly developed example of such instruction. Worthy of mention are also the Drexel Institute, Philadelphia; the General Society of Mechanics and Tradesmen, New York City; the drawing school of the Franklin Institute, Philadelphia; the Lewis Institute, Chicago; and the evening classes conducted by Young Men's Christian Associations all over the country.

THE TRADE SCHOOL is an institution that has come into existence almost entirely since the middle of the nineteenth century. The industrial conditions produced by an era of quantity of production and division of labor have developed the real problem of the trade school. In the days of the old guilds, when both production and exchange were in the hands of the master-workman, the natural provision for trade training was found in the apprenticeship system. As soon, however, as the master-workman ceased to be both merchant and craftsman, the apprentice began to lose his natural position in the industrial order. In most trades the master-workman has developed on one side into the director of an industrial establishment, or has become the foreman of a large number of workmen. From this situation, and from the fact that the specialization of labor in most trades dependent upon machinery renders any comprehensive training in such trades under ordinary conditions impracticable, and also because of the restrictive regulations of trades unions as to apprentices, arises the modern demand for the trade school. Manual dexterity and knowledge of processes are naturally the primary object in such schools. Examples of this kind of school, in spite of a general notion to the contrary, are not numerous even on the Continent of Europe.

In Germany and Austria it is considered unwise to introduce purely technical instruction into the period of the common school, so that all schools for technical training admit only pupils more than fourteen years of age. Beside the *Gewerbeschulen*, of a secondary grade, are the *Fachschulen*, or schools which deal with the training for some one special trade. These schools are distributed in industrial centres throughout the two empires according to local needs. In some of these schools the courses range from two to four years, and include instruction in drawing, elementary mathematics, science, and the technology of the particular trade. From the nature and range of instruction, many of these would be more properly classified as technical schools, and even in the cases where the object is simply to combine the elements of a general education with the training of a craftsman, the length of time required prevents any large attendance of the artisan class. The actual effect is consequently to train a few foremen and superior workmen, rather than to feed the ranks of the large army of workers. In some of the large cities, notably in Berlin, numerous evening trade classes are maintained, which afford the learner already apprenticed at a trade most practical opportunities to increase his skill, as well as to broaden his knowledge. In Belgium several distinctive trade schools exist, among which those at Tournay and Ghent are prominent. To these schools are admitted boys from thirteen to sixteen years old, who spend three years in the practice of a particular trade, together with study of general branches and drawing. Trade schools for girls have also received much attention in Belgium. In certain special trade schools in Belgium the experiment of paying the pupils for coming to the schools, in order to compensate for the loss of wages, has been made.

But it is in France that the question of training for the trades has received the greatest official attention and that the organization of schools for such training has reached the highest point. By the law of 1880, provision was made for the establishment of *écoles manuelles d'apprentissage* as a distinct class of the *écoles primaires supérieures*. These schools were intended either to prepare for or to shorten the period of apprenticeship, and were placed under the joint control of the Ministry of Public Instruction and the Ministry of Commerce and Industry. In them workshop training plays a prominent part, but a liberal amount of general instruction is also given during the three years' course. Pupils are admitted when twelve or thirteen years old. By an administrative blunder, the feature of the law of 1880 creating such schools remained inoperative until 1888, except in Paris, where the municipality early equipped and developed three successful trade schools, one for wood and metal working, one for furniture-making, and one for the book industries. After 1888 apprenticeship schools began to appear in the provinces, but inasmuch as no common programme has been defined, the amount of practical instruction varied considerably, and in many cases was far too small to serve as a substitute for apprenticeship. In 1892 the failure of these provincial schools to fulfill their intended function led to a new law, which provided that all the *écoles primaires professionelles*, in which practical work formed an important part, should be made into a new class of schools called *écoles pratiques de commerce ou d'industrie*, to be placed under the sole control of the Ministry of Commerce and Industry. The organization of such schools, in which the amount of practical instruction is increased to thirty or thirty-three hours a week, represents a deliberate attempt to establish a comprehensive system of primary trade schools under State control. In Switzerland the State and municipalities support numerous trade schools, mainly for watchmaking, in which the training, both practical and theoretical, is of a very thorough character. Another feature connected with trade training in Switzerland, and one that has to some extent been copied in Germany, is a system of apprentice examinations supervised and supported by the State. These examinations in many cantons are made obligatory upon every apprentice, and consist of an examination held at the end of the term of apprenticeship upon the practice and theory of his trade. The trade school can hardly be said to have gained a foothold in Great Britain, where the sentiment almost universally prevails that the shop is the only proper place for learning a trade.

In the United States a distinctive type of trade school was developed in the foundation of the New York Trade Schools in 1881. Both day and evening classes are conducted in this institution. The evening classes, although admitting beginners, are largely made up of young men already started at their trades. In the day classes young men are admitted only at an age—from seventeen to twenty-five—when they will be able to learn rapidly, and so acquire sufficient skill in short courses of four months to enter at once upon practical work. The purpose is to give a thorough grounding in the practice and theory of a trade which may be perfected by later experience in regular work. The school instruction is confined entirely to practical work. Evening schools similar to those of the New York Trade Schools have been established by the Pratt Institute, Brooklyn, the Philadelphia Master Builders' Exchange, and the Massachusetts Charitable Mechanics' Association of Boston. To these should be added the first instance of public support of such an institution in the Evening School of Trades at Springfield, Mass.

Another type of trade school has made its appearance in the United States in the Williamson Free Schools of Mechanical Trades (q.v.) near Philadelphia. Institutions similar in plan to some of the European trade schools, in which the aim is to combine the teaching of a trade with a general education, are represented by the California School of Mechanical Arts and the Wilmerding School of Industrial Arts of San Francisco.

In addition to the regular institutions, noted above, several instances exist in Europe and the United States of factory or employees' schools. These schools are almost uniformly conducted in the evening, and in the main provide instruction of a nature related to the practical work of the employees, such as drawing and mathematics. Examples of such schools in the United States are those conducted by R. Hoe & Co., printing press manufacturers, of New York City, and the Cleveland Twist Drill Co. The Ludlow Manufacturing Co., of Ludlow, Mass., which employs large numbers of women and girls, supports an evening school giving instruction in cooking, sewing, and physical culture. Somewhat similar classes are carried on by the National Cash Register Co., of Dayton, Ohio. Employees' schools in which specialized technical instruction is given are conducted by several associations of employees and also by individual manufacturing concerns in various parts of France. Quite different from such schools are the schools for the children of employees, which are maintained by a number of large industrial corporations in Great Britain, France, and Germany. Notable among these are the schools of Lever Brothers, Port Sunlight, England; of the Krupp Works, Essen, Germany; and the Trade School of the Northern Railway Co., Paris.

BIBLIOGRAPHY. It is impossible to indicate even in the most limited way a satisfactory bibliography of technical education. Some of the more important data are contained in the following: *Reports of the U. S. Commissioner of Education*, 1895-96, vols. i. and ii.; 1896-97, vol. i.; 1897-98, vol. i.; 1898-99, vol. i.; 1899-1900, vol. i.; *Seventeenth Annual Report of the U. S. Commissioner of Labor;* "Education in the Industrial and Fine Arts in the United States," *U. S. Bureau of Education; Report of the Royal Commission on Technical Education for Great Britain; Proceedings of the International Congresses for Technical, Commercial, and Industrial Education;* Magnus, *Industrial Education* (London, 1888); Nördling, *Ueber das technische Schul- und Vereinswesen Frankreichs* (Vienna, 1881); Mortimer d'Ocagne, *Les grandes écoles de France* (Paris, 1887); Schoenhof, *Industrial Education in France* (Washington, 1888); Holzapfel, *Die technischen Schulen und Hochschulen und die Bedürfnisse der deutschen Industrie* (Leipzig, 1897); Rein, *Encyklopädisches Handbuch der Pädagogik* (Langensalza, 1902).

TECUCIU, tâ-ko͞o′chê. A town of Rumania, in Moldavia, 40 miles northwest of Galatz, on the right bank of the Berlad River (Map: Balkan Peninsula, F 2). It has an active trade. Population, in 1900, 13,405.

TECUMA PALM. See ASTROCARYUM.

TECUM′SEH (Flying Panther, Meteor), TECUMTHE, or TECUMTHA (c.1775-1813). A famous Indian chief, born near the site of the present town of Springfield, Ohio. His father was a Shawnee warrior, and his mother a Creek or Cherokee squaw captured and adopted by the Shawnees. Having by his unusual talents for leadership gained great influence among his people, Tecumseh, when about thirty-five years of age, formed a plan for a great confederacy of the Indians against the whites, which should have jurisdiction, among other things, over the alienation of Indian lands. In this work he was assisted by his brother Elkswatawa or Tenskwatawa (q.v.), commonly known as 'The Prophet.' He was also assisted by British agents, and found the Indians the more willing to adopt his schemes because of the general dissatisfaction over the continual encroachments of the whites upon the

Indian lands. In the summer of 1808 Tecumseh and his brother established a village near the mouth of Tippecanoe Creek in Indiana, and here Tecumseh put into practice some of his ideas for returning to the virtuous primitive condition of the Indians by prohibiting the use of whisky and other demoralizing practices introduced by the whites. Two years later he went on a visit to the southern Indians, especially the Choctaw, Creek, Cherokee, and Seminole, and by his wonderful eloquence is considered to have kindled among them the flame that in 1813 burst into the Creek War. In his absence, however, his followers were defeated on November 7, 1811, by a force under General William Henry Harrison. (See TIPPECANOE, BATTLE OF.) In the following year he joined the British at Malden, and early in August routed a force of Ohio militia, but was defeated and wounded in the skirmish of Maguaga. Despite his defeat, however, he was commissioned a brigadier-general in the British Army, and with several hundred Indians assisted in the capture of Detroit. In January, 1813, he played an important part in the siege of Fort Meigs (q.v.), and prevented the massacre of prisoners taken in the sortie from the fort. After Perry's victory on Lake Erie Tecumseh protested against the British retreat from Malden. He accompanied the retreating army, however, and at the battle of the Thames (q.v.) was killed while bravely resisting the attack of the mounted Americans under Colonel Richard M. Johnson. Tecumseh was a man of many high qualities, with impressive manners and wonderful natural eloquence. The part he played in the War of 1812 was an exceedingly important one. Indeed, as a Canadian historian has pointed out, it is quite conceivable that had it not been for Tecumseh, the Americans would have conquered Canada. Consult: Drake, *Life of Tecumseh and His Brother, the Prophet, with an Historical Sketch of the Shawnee Indians* (Cincinnati, 1841); and Eggleston, *Tecumseh and the Shawnee Prophet* (New York, 1878).

TEDAS, tā'dȧz. The northern division of the Tibbus (q.v.), living in Tibesti and the adjoining oases of the Eastern Sahara, and connected with the outside world by the main camel route between the city of Tripoli and Lake Chad. In this portion of the Great Desert are inexhaustible supplies of rock salt, and the Tedas employ thousands of camels in conveying this material throughout Central Africa.

TED'DINGTON. A town in Middlesex, England, on the Thames, 2½ miles southwest of Richmond (Map: London and vicinity, F 4). The municipality maintains reading rooms and recreation grounds, and provides garden allotments. The National Physical Laboratory was inaugurated here in 1902. Population, in 1891, 10,052; in 1901, 14,029.

TE DEUM. A well-known hymn, so called from its opening words (*Te Deum laudamus, te dominum confitemur*, We praise Thee, O God, we acknowledge Thee to be the Lord), commonly sung on all occasions of triumph and thanksgiving, and a theme upon which the most celebrated composers have exercised their musical genius. The hymn is one of the most simple, and at the same time the most solemn and majestic and most admired in the whole range of hymnology. Its authorship is uncertain. Picturesquely and uncritically it has been described as the joint production of Saints Ambrose and Augustine, into which they both burst forth by a common inspiration on occasion of the baptism of Augustine. From this supposed origin, the Te Deum is commonly called the Ambrosian hymn. It is ascribed by other authorities to Hilary of Poitiers, but is most probably considerably later. Besides its general use on occasions of joyous celebrations, the Te Deum forms part of the daily matins of the Roman breviary, and is recited at the end of matins on all festivals, and on all Sundays except those of Advent and Lent. With a similar exception, it forms part of the morning prayer of the Anglican Prayer Book, being sung after the first lesson. Its use dates from the sixth century.

TEES. A river of Northern England. It rises on Cross Fell, Cumberland, and flows east between the counties of Durham and York. It enters the North Sea 10 miles below Stockton, to which town it is navigable for small vessels. Length, 80 miles (Map: England E 2).

TEETH (AS. *tāþ*, Goth. *tunþus*, OHG. *zand*, *zan*, Ger. *Zahn*, tooth; connected with OIr. *dēt*, Bret., Welsh *dant*, Lith. *dantis*, Lat. *dens*, Gk. ὀδούς, *odous*, ὀδών, *odōn*, Skt. *danta*, tooth, probably originally the pres. part., with loss of the initial vowel, of Skt. *ad*. Gk. ἔδειν, *edein*, Lat. *edere*, to eat, OChurch Slav. *yamĭ*, Lith. *edmi*, *edi*, I eat, OIr. *ith*, Goth. *itan*, OHG. *ezzan*, Ger. *essen*, AS. *etan*, Eng. *eat*). Calcareous organs imbedded in the skin within or near the mouth in most vertebrates, acting primarily for the prehension and trituration of food. Some teeth, such as the tusks of the wild boar or of the elephant, have secondarily acquired another function, namely, that of offensive and defensive organs, especially with reference to combats between rival males.

Teeth are dermal structures, homologous with the placoid scales or denticles which cover the entire body of fishes (q.v.). At the anterior end, say of the body of a dogfish, the skin turns in to form the lining or mucous membrane of the mouth and with it the scales are carried. In fishes these dermal denticles appear in the skin very early both in their ontogenetic and phylogenetic history, but do not occur in Amphioxus or in cyclostomes. They first appear in selachians in the form of small denticles or spines arranged in longitudinal and transverse rows, each attached to a basal plate, and directed caudad. Both ectoderm and mesoderm take part in the formation of these dermal denticles, as in the case of the teeth of the higher vertebrates. The name 'tooth-germ' is given to the tissue that is destined to develop into the teeth. The mesoderm forms a papilla which secretes dentine in its outermost layer. Within the dentine there is a cavity filled with mesodermal tissue and blood vessels. From this cavity fine tubules pass into the dentine. Outside the dentine is a layer of enamel secreted by ectodermal cells. The first impulse toward tooth-formation seems to reside in the derma. As the dermal papilla grows it comes to be covered by a layer of large columnar cells from the epidermis. The enamel is secreted from the lower surface of these epidermal cells. As the dermal cells multiply, they give rise to an elongated papilla which projects backward. The deep-lying connective-tissue layers of the derma at the same time secrete salts of lime and thus a sort of connective-tissue bone (the so-called 'tooth-cement') is produced, and by means of it the spine gains a firm support. The basal plates of tooth-cement form a shield of considerable protective value, and in some fishes, such as the bony ganoids, a hard protective skeleton is thus produced. In the higher vertebrates this bony covering is lost over most of the body, but persists in the head region, and becomes some of the most important bones of the skull.

In fishes the teeth are usually abundant, and are either spiny or blunt, and may be set close together like a cobble-stone pavement (see CESTRACIONT) to fit them for grinding up shells. In the swordfish they form the teeth of the sword. Amphibians possess few teeth. They are conical, end in a single or double apex, and are usually present on the premaxilla, maxilla, mandible, vomer, and palatine bones, and occasionally on the parasphenoid. They occur in additional locations in the larvæ of some forms. Teeth are present in all groups of reptiles except the Chelonia, and even there exist for a time in the embryonic stage of Trionyx, showing that the toothless state has been secondarily acquired by the turtles. The reptilian teeth are usually larger and stronger, and are limited to more special regions, than among lower vertebrates. The teeth of reptiles, as well as those of fishes, are in general 'homodont,' or alike throughout the series. In reptiles the teeth are connected with their support in two ways: either the teeth are firmly fused to the bone, or else they lie in cup-shaped sockets of the bone, the 'alveoli.' This condition exists in the so-called 'thecodont' reptiles. The teeth, which are fused to the bone may either lie in a furrow at the inner side of the jaw-bone ('pleurodont' type) or else they arise from its free upper edge (in the case of the lower jaw), and are 'acrodont.' In many kinds of snakes certain of the maxillary teeth of the upper jaw are differentiated into organs of offense and defense. These are the 'fangs' or poison-carrying teeth. (See SNAKE.) Birds have no teeth. Fossil birds (q.v.), however, possessed teeth, which were either imbedded in grooves (Hesperornis) or in definite alveoli (Ichthyornis).

The dentition of mammals is highly variable, and the differentiation of the teeth in the various forms is to be explained by adaptation to the character of the food. All the teeth are imbedded in alveoli of the jaw-bones, to which the growth of teeth is confined. The teeth are so arranged that those of the upper and lower jaws alternate. The teeth of one jaw oppose the interspaces between the teeth of the other jaw. Thus each tooth presses against a portion of two teeth of the opposite set. When all opposing pressure fails the tooth thus rendered functionless tends to be extruded. This alternating arrangement prevents the loss of one tooth from greatly affecting the teeth of the opposite set. Most mammals are 'diphyodont'—that is, possess two sets of dentition—namely the deciduous or 'milk' dentition and the permanent teeth. In most of the fishes as well as in many of the Amphibia and reptiles the teeth can be renewed indefinitely. A few mammals, namely the Cetacea and Edentata, are 'monophyodont,' that is, possess only one set of teeth. The milk teeth are supplanted by a process of absorption which goes on in certain cases to such an extent that the root is practically removed. This removal is effected by giant cells analogous to, if not identical with, the osteoclasts that tear down bone. The teeth usually cease to grow after being fully formed, but in edentates and rodents growth continues throughout life, and is necessary in order to supply the wear on the teeth brought about by the gnawing habits of these animals.

Mammalian teeth are classified according to their shape and function into incisors, canines, premolars, and molars. The four front teeth in the case of man are blunt, flattened, and chisel-shaped, and are fitted for cutting or dividing the food. They are the 'incisors.' In recently cut incisors the cutting edge is raised in three scallops, which soon wear away. The edge of the incisor is formed by a beveling off of the dentine on the inner or lingual surface. The two central upper incisors in man are slightly larger than the two laterals. This difference is more marked in anthropoid apes. The lower central incisors are narrower than those of the upper jaw. The lower lateral incisors are larger than the lower central pair. The two canines or 'eye-teeth' on each jaw are stronger both in root and crown than the incisors. The crown is blunt and pointed. The canines are succeeded by two premolars or 'bicuspids' on each side of the jaw, which correspond to the three and four premolars of the typical mammalian dentition. Their crowns possess two cusps. The root is normally single, but is often grooved or cleft by a longitudinal furrow into two or even three roots. The premolars of the lower jaw are smaller than those of the upper. The molars are three in number on each side of the jaw. The form of the first molar is the most constant. The roots are three in number. The third molar, or 'wisdom tooth,' is the most variable as to its time of appearance; it may be cut almost as soon as the other molars, or many years later, or not at all.

In existing mammals there is a certain degree of gradation between the forms of the teeth. The typical number of mammalian teeth is 44. The human number is 32 in the permanent set and 20 in the milk set. In the human set the third incisor and the first two premolars of the typical mammalian set are absent, hence at the canines in man there is an abrupt change both in front and behind. For convenience and brevity the number and kinds of teeth of mammals are usually designated by means of a formula as follows:

For marsupials:

$$i\,\tfrac{3}{3}\;c\,\tfrac{1}{1}\;pm\,\tfrac{3}{3}\;m\,\tfrac{4}{4} = 44.$$

For eutherian mammals:

$$i\,\tfrac{3}{3}\;c\,\tfrac{1}{1}\;pm\,\tfrac{4}{4}\;m\,\tfrac{3}{3} = 44.$$

For man:

$$i\,\tfrac{2}{2}\;c\,\tfrac{1}{1}\;pm\,\tfrac{2}{2}\;m\,\tfrac{3}{3} = 32.$$

It is often very difficult to determine which teeth are to be accounted incisors, canines, etc., and the following rule is sometimes employed:

Incisors, upper jaw, on premaxilla.

Incisors, lower jaw, correspond to upper.

Canines of upper jaw, next tooth immediately behind suture of maxilla and premaxilla.

Canines of lower jaw, close in front of upper canine.

Premolars replace milk molars.

Molars, behind milk molars (when present).

A tooth is usually described as consisting of three parts—the crown, neck, and root—and is composed of three hard secretions—the dentine, enamel, and cement—and a central pulp cavity. The human tooth fits into the jaw-bone much like a peg into its socket. This manner of union is termed 'gomphosis.' The tooth does not, however, occupy the entire socket, for there is besides a lining of periosteum, which at the root turns upward around the tooth as far as the neck, where it becomes continuous with the gums. This packing around the tooth is somewhat elastic and allows of slight motion. The elasticity of the packing doubtless diminishes the shock which would be caused in mastication were the teeth rigidly attached in their bony sockets. When the periosteum is inflamed the swelling pushes the tooth outward in the socket and loosens it. The dentine forms the great mass of the tooth, surrounds the pulp cavity, and is covered, in the human tooth by a layer of enamel, the hardest of animal tissues; in other mammals this layer of enamel may cover all or only a part of the exposed portion of the tooth, or may be absent. The condition that more commonly prevails is that the enamel envelops the entire crown of the tooth and stops rather abruptly at about the level of the gum.

In its finer structure dentine is in some cases difficult to distinguish from true bone. Typical dentine, such as exists in human teeth, differs from bone both in structure and in chemical composition, and is known as 'hard' or 'unvascular' dentine. It is hard, elastic substance with a yellowish white hue, which is made up of a number of minute, wavy, branching tubules, parallel to one another and opening internally into the pulp cavity. These tubuli contain finely cylindrical prolongations (dentinal fibres) from cells in the pulp cavity, intimately connected with the nerves of the pulp. The different kinds of dentine have been classified as (1) hard or unvascular dentine; (2) plici-dentine; (3) vaso-dentine; (4) osteo-dentine. The unvascular dentine has been described above. In the second class the pulp cavity is irregular in outline, with many tubes and canals traversing the dentine in various directions, some carrying blood-vessels. Such a condition obtains in many of the lower vertebrates and in some mammals. The osteo-dentine closely approaches bone in structure. In it pulp and calcified tissue are mixed up, for there is no distinct pulp cavity. Such dentine is found in the teeth of many sharks.

The cement forms a coating over the roots of the teeth and when unusually thick may even unite the roots of contiguous teeth. In the human teeth it extends upward to cover the edge of the enamel. It covers, at first, the entire teeth of certain vertebrates, such as the elephant, and covers the crowns of the teeth of ruminants. It is derived from the tooth-follicle and is closely allied to bone.

The cavity of the tooth is filled with the tooth-pulp, which is composed of a gelatinous matrix and contains cells, nerves, and blood-vessels. The outermost cells, known as 'odontoblasts,' form a layer next the bone. These cells are connected by processes with one another and with deeper lying cells, and on the periphery the processes extend into the dental tubuli.

The gums are continuous with the mucous membrane of the mouth, but are much thickened. Within the gums are tendinous faciculi, and others extend up into them from the periosteum. These give the gums hardness. They are richly supplied with blood-vessels, but have few nerves. The gums are continuous with the periosteum of the alveoli, a connective tissue richly supplied with blood-vessels and nerves.

BIBLIOGRAPHY. Tomes, *Manual of Dental Anatomy, Human and Comparative* (London, 1876); Owen, *Odontography* (London, 1840-45). See INTEGUMENT; SKELETON; DENTISTRY.

TEFFT, BENJAMIN FRANKLIN (1813-85). A Methodist Episcopal clergyman. He was born near Utica, N. Y., and graduated at Wesleyan University, Middletown, Conn., 1835. He taught in the Maine Wesleyan Seminary, Kents Hill, Me., 1835-1839; was principal of Providence Conference Seminary, East Greenwich, R. I., 1841; professor of Greek and Hebrew languages and literature in Indiana Asbury University (now De Pauw University), Greencastle, Ind., 1843-1846; editor of *The Ladies' Repository*, Cincinnati, O., 1846-50; president of Genesee College, Lima, N. Y., 1851-1854; chaplain of First Maine Cavalry, 1861; United States consul at Stockholm and acting Minister to Sweden, 1862; Commissioner of Immigration from the North of Europe for the State of Maine, 1864; and editor of *The Northern Border*, Bangor, Me., 1873-78. He wrote: *The Shoulder Knot* (1850); *Hungary and Kossuth* (1851); *Webster and His Masterpieces* (1854); *Methodism Successful* (1860); *The Present Crisis* (1861).

TE'GEA (Lat., from Gk. Τεγέα). An ancient city of Southeastern Arcadia, Greece. Its territory included the southern part of the great eastern plain of Arcadia, of which the northern part was occupied by Mantinea (q.v.). It was a place of considerable size, and it appears to have included the modern villages of Hagios Sostis, Palæo-Episkopi, Piali, and Ibrahim Effendi, south of Tripolitza, though but few remains are visible, partly because of a deep deposit of alluvium, and partly from the destruction due to the later inhabitants. The most important ruins are those of the great temple of Athena Alea, built by Scopas (q.v.), and now (1904) in process of excavation by the French School at Athens. The dimensions of the temple (about 163 × 70 feet) and important fragments of its sculptures were determined by Milchhöfer in 1879. The city was celebrated in the heroic legends, and for a long time seems to have opposed Sparta on equal terms, but during the sixth century B.C. was forced to join the Spartan league. At Thermopylæ, we are told, were five hundred Tegeans, and at Platæa three thousand, of whom one-half were hoplites. Later they were again involved in war with Sparta, and after two defeats remained true allies until the invasion of Epaminondas (B.C. 370), when a democratic government replaced the aristocracy, and the city joined in the foundation of Megalopolis. Later we find Tegea in the Ætolian League, in alliance with Sparta, forced into the Achæan League, at war with Sparta, and sharing in the confused politics which mark the history of the lesser Peloponnesian cities during the third and second centuries. A good account of the place was given by Pausanias in the second century of our era, and it seems to have been one of the most flourishing towns of Arcadia till it was sacked by Alaric. Consult, besides the larger works on the Peloponnesus (q.v.) by Dodwell, Leake, Curtius, and others, and Schwedler, *De Rebus Tegeaticis* (Leipzig, 1889).

TEGERNSEE, tā'gĕrn-zā. A village in Upper Bavaria, charmingly situated on the lake of the same name, with an imposing castle, formerly a Benedictine abbey, founded in 719 and suppressed in 1804, and now the property of Dr. Charles Theodore, Duke of Bavaria, who is a skillful oculist and has established an ophthalmic infirmary in the village, where he examines and performs operations on patients gratuitously. The beautiful walks in the environs attract numerous visitors in the summer. A favorite point is the Grosse Paraplule, 2680 feet high and affording an admirable view of the lake and the encircling mountains. At the northwestern end of the lake lies Kaltenbrum, the model farm of Duke Charles Theodore.

TEGETMEIER, tĕg'ĕt-mī'ēr, WILLIAM B. (1816—). A British naturalist and author. He received a medical education, but turned his attention to natural history, and became a coworker with Darwin in experiments and observations on the question of variation (q.v.) and other scientific problems. To these he contributed mainly by study of domestic animals and especially of pigeons, and was instrumental in advancing the breeding and improvement of carrier pigeons and of fine poultry. In 1857 he became a leading editor and essayist of *The Field* (of London). He wrote several important works on ornithology and the rearing of domestic animals.

TEGETTHOFF, tĕg'ĕt-hôf, WILHELM, Baron (1827-71). A distinguished Austrian admiral, born at Marburg, in Styria. He entered the Austrian navy, distinguished himself in the naval encounter with the Danes off Helgoland in 1864, became rear-admiral, and in the war of 1866 commanded the Austrian fleet in the Adriatic. On the 20th of July he attacked and defeated the Italian fleet under Admiral Persano off the island of Lissa, although the Italian fleet was superior in the number of iron-clads to the Austrian. For this brilliant victory Tegetthoff was promoted vice-admiral. In 1867 he was sent to Mexico to obtain from the Government the body of the Emperor Maximilian, and in 1868 he was made commander-in-chief of the navy.

TEGNÉR, tĕg-nâr', ESAIAS (1782-1846). A Swedish poet, born at Kyrkerud, in Wermland. Tegnér graduated from the University of Lund (1802) and in 1805 became sub-librarian of the university and lecturer on æsthetics. In 1811 his poem on Sweden (*Svea*) won him universal admiration and an academic prize. Already his war-songs and national odes had attracted the attention of the King and Government. In 1812 he was made professor of Greek at Lund, and for the next decade gave himself almost wholly to clerical duties and theological studies. During these years he wrote the remarkable religious idyls, *The Priest's Consecration* and *The Children of the Lord's Supper* (*Nattvardsbarnen*, 1820), as well as the fine romantic poem *Axel* (1822). His fame, however, rests on the *Frithjof's Saga*, finished in 1825, which remains the most popular poem in Swedish, though it lacks originality and unity, adhering very closely to the legend on which it is founded and being less an epic than a series of ballads and odes. Even while unfinished it had sufficed to secure for Tegnér the nomination of the clergy to the Bishopric of Wexiö (1824). In 1840 the insanity that afflicted his family unmistakably asserted itself. After a period in an asylum he returned for a little while to active work, but soon became paralytic and so lingered till death. Thus it appears that Tegnér's significant production is confined to the years 1811-25, and more strictly speaking to the last six of these, which saw *The Priest's Consecration, The Children of the Lord's Supper, Axel, Frithjof. Frithjof* has been rendered into many languages and nineteen times into English, best by Longfellow, who also translated *Nattvardsbarnen.* It was effective in banishing classical French taste from Sweden and in introducing the literary ideals of the Romantic school, though Tegnér always kept the clearness and artistic finish that go with calm objectivity. His verse is melodious, graceful, dignified, yet fresh, vigorous, and not without national or religious enthusiasm, in spite of its impersonality. See SWEDISH LITERATURE.

Tegnér's *Works* were collected in 7 vols. (Stockholm, 1847-51). Three volumes of supplementary writings were printed (ib., 1873-74), and a new collected edition made of the works in 8 vols. (ib., 1882-85). The more important poems are in English, French and German translations. A *Life* by Böttiger is prefixed to the first collected edition of the *Works.* Consult also Brandes, *Eminent Authors*, trans. (New York, 1886); and Erdmann, *Esaias Tegnér* (Stockholm, 1896).

TEGUAN. One of the local names of a flying phalanger of New South Wales (*Petaurista volans*), which is black and about the size of the large Indian flying squirrels. It resembles the other flying phalangers (q.v.) in the possession of an effective parachute, and in its habits. Also spelled 'taguan.'

TEGUCIGALPA, tā'gōō-sē-gäl'pȧ. The capital of Honduras, Central America, situated on the left bank of the upper course of the Choluteca, seventy-eight miles from its seaport, Amapala, on the Gulf of Fonseca (Map: Central America, D 4). It has a healthful location on a table-land 3250 feet above sea-level, in the most thickly populated portion of the Republic. The region is known for its agricultural resources and its mines of gold and silver and marble, though the latter have largely lost their former importance. During the closing years of the eighteenth century their annual output averaged $25,000,000. The most important structure in the Republic is its cathedral. There are a national university and a ladies' seminary. Tegucigalpa was an Aztec city and a place of some importance during the eighteenth century. It became the capital of Honduras in 1880. Population, about 18,000.

TEHERAN, or TEHRAN, tĕ-h'-rän'. The capital of Persia and of the Province of Teheran, 70 miles due south of the Caspian Sea, in latitude 35° 41' N., longitude 51° 25' E., on a sandy and stony plateau 90 by 40 miles in extent (Map: Persia, D 3). Its elevation is 3800 feet. In 1869 the Shah caused the mud walls of the city to be torn down and five years later it was surrounded by a ditch and 58 bastions, after the method of Vauban. It is now in the form of an irregular octagon, inclosing 7½ square miles, and having twelve gates. Several broad, handsome boulevards have been laid out, and are lighted by gas, and a beginning has been made in the Western style of architecture. The sanitary conditions have likewise become improved. The bazaars are the centre of life. There are seven miles of tramways, and a railroad to Shah-Abdul-Azim, six miles south of the capital. The 'Ark' or fortified palace of the Shah, in the northern quarter of Teheran, contains prisons, a military school, beautiful gardens, baths, kiosks, and several other handsome buildings, including the harem. The wealthy citizens dwell in elaborate and costly establishments with lovely gardens, tiny ponds, and ventilating towers. The town has a library, founded in 1850, a normal school, a military college, and Kings' College, a polytechnic school, dating from 1849, with European professors, where Arabic, English, French, and Russian, mathematics, telegraphy, engineering, military tactics, music, and painting are taught. To some of the many mosques are attached 'Madrasahs' (colleges). The mosque called Masjid-i-Shah (mosque of the King) with a beautiful enameled façade, and the Masjid-i-Madar-i-Shah (mosque of the King's mother) deserve mention. There are many baths, Mohammedan and Armenian, the Europeans using the latter. During the summer, on account of the unhealthfulness of the town and the intolerable heat, the embassies, as well as the wealthier inhabitants, move to the slopes of the neighboring mountains.

Water is furnished by numerous underground watercourses leading from the mountains. The supply, however, is not regulated, because of the private ownership of many of these canals. The town accordingly suffers from a lack of water in summer and has a superfluity in winter. Irrigation is thus provided for, however, and the surrounding country has been made highly productive. Teheran manufactures cotton, linen, carpets, shoes, hats, and ironwork, but is not a leading centre of manufacturing. It has, however, an important general caravan trade. An excellent highway 217 miles long, constructed by Russian capital, and completed in 1899, extends from Resht on the Caspian to Teheran. To the south lie the ruins of Rei, the birthplace of Harun-al-Rashid, known in the time of Alexander the Great as Ragæ, the Rhages of Scripture, the capital of Parthia. The population varies from 160,000 in summer to 250,000 in winter. This includes 500 Europeans, 4000 Armenians, and 4000 Jews. There is a Catholic mission school. Teheran, according to Morier, is the Tahors of the Theodosian Tablets.

ṬEHRI, tä′rē, or, more properly, Garhwal. A native State of British India included territorially in the United Provinces of Agra and Oudh. It borders upon Tibet, and lies wholly within the Himalayas, around the sources of the Ganges, being a highly elevated and rugged mountain region. Area, 4180 square miles. Population, in 1901, 268,885. Capital, Tehri.

TEHUANTEPEC, tȧ-wän′tȧ-pĕk′, Isthmus of. The narrowest portion of Mexico as well as of the American continent north of Costa Rica. It stretches in an east and west direction between the Gulf of Campeachy, an arm of the Gulf of Mexico west of Yucatan, on the north, and the Gulf of Tehuantepec, an arm of the Pacific Ocean, on the south. Its least width, from Coatzacoalcos to the head of the Lago Superior, is 120 miles. The plateaus of Mexico and Guatemala are here separated by a depression falling to an altitude of 680 feet. This fact as well as the geographical position of the isthmus has led to numerous schemes for some means of interoceanic communication at this point, including projects for a ship canal. (See Trans-isthmian Canals.) A railroad across the isthmus was completed by the Mexican Government in 1894, and recently large sums have been expended upon it in order to bring it up to the needs of a great traffic.

TEHUELCHE, tȧ-wĕl′chȧ. A general term for several different Patagonian tribes, who are, however, probably closely related. There is some evidence that the Tehuelches are immigrants from the more northern portions of South America, but their origin is still doubtful. Within recent years the encroachments of Europeans and Gaucho mixed-bloods have driven the Tehuelches far to the south until now they occupy a relatively small territory between the Strait of Magellan and the Santa Cruz River. They are noted chiefly for their very tall stature, being often considered the tallest of human races. Accurate observations on this point are few, but it is probable that the average stature of male Tehuelches is not far from 1.75 m. They are also very brachycephalic in head form. In culture they are low. Consult: Masters, *At Home with the Patagonians* (London, 1871); Lista, *Viage al pais de Tehuelches* (Buenos Ayres, 1878).

TEIGNMOUTH, tĭn′mŭth. A seaport and watering place on the south coast of Devonshire, England, situated on the English Channel, at the mouth of the Teign, 15 miles south of Exeter (Map: England, C 6). The harbor is safe and commodious, though difficult of entrance. There is a considerable sea and river fishery. An average of 1200 vessels clear the port annually. The town received a market grant from Henry III. It was burnt by the Danes in 970 and by the French in 1340 and 1690. Population, in 1901, 8636.

TEIGNMOUTH, John Shore, First Baron (1751-1834). An Anglo-Indian statesman. He was born in London, was educated at Harrow, and in 1769 entered the civil service of the East India Company. From 1775 to 1780 he was a member of the revenue council at Calcutta, and was appointed by Warren Hastings one of the committee of revenue which superseded the council. After a visit to England in 1785-86 he returned to India in 1787 as a member of the supreme council of Bengal. The organization of the revenue and judicial systems of Bengal and the measure on *Zamindari* proprietorship of the soil which was ratified by Lord Cornwallis, were largely due to Shore's initiative, and on Cornwallis's retirement in 1793 Shore was made Governor-General of India. He was created a baronet in 1792. On his retirement in 1798 he was raised to the peerage as Baron Teignmouth. He was the first president of the British and Foreign Bible Society from 1804 until his death. He wrote *Memoirs of the Life, Writings, and Correspondence of Sir William Jones* (1804). Consult Teignmouth, *Life and Correspondence of*

John Shore, first Baron Teignmouth (2 vols., London, 1842).

TE'JA, or **TEIAS.** The last King of the Ostrogoths. He was chosen King after the death of Totila (q.v.) who fell in battle against the Byzantines under Narses, at Tadino, A.D. 552. The Gothic kingdom received its death blow in that battle and it was left to Teja only to prolong the hopeless struggle. He sought to gain the aid of the Frankish King Theudebald, but failed. While marching to the relief of Cumæ he was met by the Imperial army under Narses and thereupon took up an impregnable position near the foot of Mount Vesuvius, where the Goths were invested by the enemy. After two months want of food compelled the Goths to abandon their position and they retired to the Lactavan Hill, whence they made a desperate onslaught on the Romans. In the two days' battle Teja perished after performing wonderful deeds of valor (553). The remnant of the Goths were permitted to leave Italy. See GOTHS.

TEJADA, tâ-hä'dâ, LERDO DE, President of Mexico. See LERDO DE TEJADA.

TEJON. The Mexican name of the local species of badger (q.v.).

TEJU (abbreviation of *Tejuguacu,* the native name). One of the large and powerful South American lizards of the family Tejidæ, and especially of its principal genus, Tupinambis. This family comprises nearly 40 genera with more than 100 species, and exhibits great diversity, as might be expected when it is known that its range covers the whole of South and Central America, the West Indies, Mexico, and the Southwestern United States. The largest of the family (*Tupinambis teguexin*) is three feet long to the end of its long, terete, tapering tail; is bluish black with irregular yellow cross-bands, and reddish yellow underneath. They frequent woodlands and plantations, and live in burrows. They are carnivorous and are able by their swiftness and agility to capture most small animals.

TEKELI, tĕk'ĕ-lĭ. An Hungarian patriot. See TÖKÖLY.

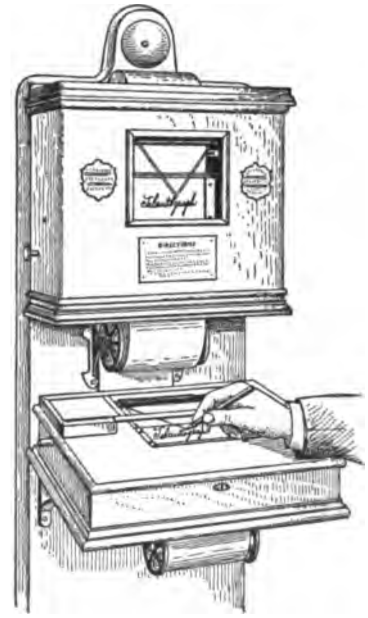
TEKIYE, tâ-kē'ye. A Mohammedan monastery inhabited by dervishes (q.v.) or other ascetics. It is usually built about a court inclosed by a colonnade, beyond which are the chambers, sometimes covered with domes. Well-known examples are the tekiye of the dancing dervishes at Pera and the one built near Damascus by Sultan Selim in 1516.

TEKNONYMY (from Gk. *τέκνον, teknon,* child + *ὄνυμα, onyma, ὄνομα, onoma,* name). A custom found among certain savage groups whereby a father (in some cases both parents) after the birth of a child gives up his own name and is known by the name of the child. The custom is seen most completely developed in Java, Sumatra, Borneo, Celebes, and the neighboring islands. It is also found among Arabs and Persians, in Alaska, Polynesia, Australia, and in isolated groups in other parts of the world. The more commonly accepted explanation of the custom is that the assumption by the father of his child's name is an assertion on his part of his fatherhood and is indicative of the growth of the patriarchal idea. The chief opposing view is that it is nothing more than an expression of the desire, prevalent in all stages of culture, to be distinguished by one's most valued possession. The probabilities are that a number of customs of diverse origin are included under the term.

TEKUTCHIU, tâ-ko͞o'chê. A town of Rumania. See TECUCIU.

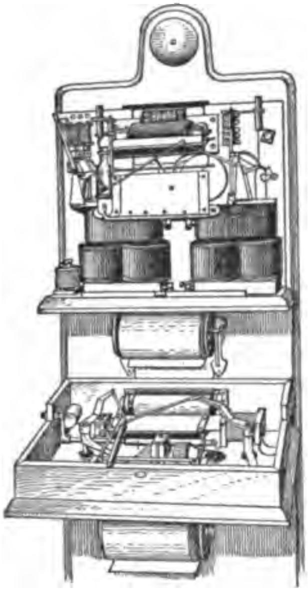
TEL'AMON (Lat., from Gk. Τελαμών). In Greek mythology, the son of Æacus. Having been driven out of Ægina for helping Peleus to kill their half-brother Phocus, he married Glauce, daughter of the King of Salamis, and became King of the island. He was the father of Ajax, took part in the Calydonian Hunt and the Argonautic Expedition, and went with Hercules against Troy and the Amazons.

TELAUTOGRAPH (from Gk. Τῆλε, *tēle,* afar + *αὐτός, autos,* self + *γράφειν, graphein,* to write). An instrument invented by Elisha Gray for electrically reproducing at a distance handwriting, drawings, figures, and the like. A transmitter and receiver are associated together for use at each station, and are connected by two line wires with a similar set at the distant station or with a central exchange. Power corresponding to the amount used in two ordinary incandescent lamps is taken at each end from the electric lighting circuit. The motion of a pencil in writing is resolved into two component motions by connecting to the pencil points two light levers, hinged at their junction to the pencil. The motion of these rods is communicated to two rotary shafts, to which are attached arms, carrying at their outer ends contact rollers, which move to and fro upon the surfaces of two arc-shaped plates, upon which is wound resistance wire, forming part of the power circuit. The motion communicated to the rollers by the pencil serves to cut resistance in or out of two circuits, and thus two independent, variable currents are obtained, which depend for their



TELAUTOGRAPH.

strength upon the position of the pencil on its writing surface. At the receiver are two strong electro-magnets, each one having one of its poles inclosed by the other, forming two annular spaces, across which the magnetic fields are uniform and constant. In these annular spaces are suspended two light coils of copper wire attached to bell-crank devices and light rods to a set of shafts and levers, similar to those at the transmitter. The pull of each magnetic field upon these suspended coils is opposed by a retractile spring, and the pen at the receiver is thus caused to take a position in its writing field exactly corresponding to that of the transmitter pencil. The switching on of the transmitter by means of a switch at the transmitter end automatically brings fresh paper to the writing surface from a roll beneath the transmitter, throws the receiver at the distant end into operating position, shifting its paper and raising the pen from the ink-well ready to write. When the transmitter is switched off no current is consumed at either end. A small switch placed beneath the writing surface at the transmitter is opened and closed by the pressure of the pencil thereon, and serves to control by means of induced vibratory currents and a suitable relay, the receiving pen, causing it to be raised from the paper or lowered to it, in unison with the movements of the transmitting pencil. The ink is automatically supplied to the receiver pen, and when not in use the pen rests with its tip immersed in the ink, and thus is always ready for service. The writing field is 2 inches by 5 inches, thus affording space for three lines of ordinary writing, each 5 inches long. Upon this field the writing is done and when filled a simple movement of the switch at the transmitter brings fresh paper into service at both ends of the line. A small push button serves to operate a call bell, by which all signaling is done.


TELAUTOGRAPH WITH CASE REMOVED SHOWING MECHANISM.

The instrument is used by the United States Army in transmitting messages from the range-finding stations in the coast defenses to the high-power guns, telephones having been found unsatisfactory for this service, because disabled by the unavoidable shock. In commercial work the telautograph can be conveniently employed, as it makes a double record of each message, one for the sender and one for the person addressed.

TELAV, tyĕ-läf′. A district town in the Government of Tiflis, Russian Transcaucasia, 63 miles east-northeast of Tiflis (Map: Russia, G 6). It was formerly the capital of Kachetia and has ruins of old palaces. Population, in 1897, 11,810, chiefly Armenians and Georgians.

TELEDU. See Badger.

TELEG′ONUS (Lat., from Gk. Τηλέγονος). The son of Odysseus by Circe. Having been sent to Ithaca to find his father, he failed to recognize him in combat and slew him, afterwards taking the body home, together with Telemachus and Penelope, whom he married. He was looked upon as the founder of Tusculum and Præneste, and, through his daughter Mamilia, as the ancestor of the Roman Mamilii. His story is the theme of the *Telegonia*. See Trojan War.

TELEGONY (from Gk. τῆλε, *tēle*, afar + -γονία, *-gonia*, generation, from γόνος, *gonos*, seed, from γίγνεσθαι, *gignesthai*, to become, to be born). The influence of the first or of a previous sire on the subsequent progeny obtained by other sires. That the first impregnation has a lasting influence has been generally accepted by breeders. Weismann, however, states that the most competent judges in Germany, such as Stettegast, Nathusius, and Kühn, in spite of their extensive experience in breeding and crossing, have never known a case of telegony, and doubt its reality.

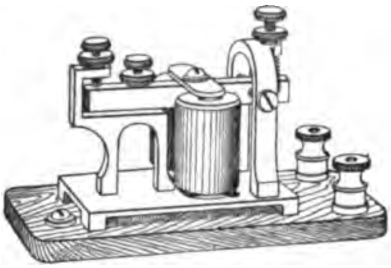
TELEGRAPH (from Gk. τῆλε, *tēle*, afar + γράφειν, *graphein*, to write). The transmission of messages by means of electricity. With the discovery that electric currents could be transmitted instantly over long distances came the idea of employing them for signaling, and in 1774 Bishop Watson made some experiments in discharging Leyden jars through 10,600 feet of wire, suspended on wooden poles, in the neighborhood of London. In the *Scots Magazine* in 1753 a detailed description of a plan for electric telegraphy is given, and in 1774 a telegraphic line was erected by Lesage at Geneva, Switzerland, which consisted of twenty-four wires connected to pith-ball electroscopes (q.v.), each representing a letter. When the connection between the frictional machine or charged conductor and any electroscope was made the pith-ball was repelled. The difficulty of using frictional machines, the only method for producing electricity then known, however, prevented the attainment of any practical results in this direction before the discovery of the voltaic cell. In Germany the invention of the telegraph is credited to Sömmering of Munich, whose original apparatus, constructed about 1809, was exhibited in operation at the Congress of Electricians at Frankfort in 1891. This instrument consisted of a series of voltameters each corresponding to a certain letter or signal. On closing the key in any circuit the signal was transmitted to the corresponding voltameters and the water in the appropriate tube was decomposed. A similar plan was proposed about the same time by Dr. J. R. Coxe, of Philadelphia. Immediately after the discovery of electro-magnetism by Oersted, in 1820, Ampère determined to apply the idea to telegraphy, and read a paper before the Paris Academy of Sciences on the use of coils of wire surrounding magnetic needles instead of voltameters for this purpose. Baron Schilling in 1832 exhibited a telegraphic model in Russia in which the letters were represented by the deflections of a single needle. Weber and Gauss modified this plan by using a magnet suspended horizontally, to which a mirror was attached. This arrangement enabled the passage of extremely weak currents to be observed as a beam of light from a lamp was reflected from the mirror mounted in connection with the suspended needle and produced a bright spot which moved along a screen with any deflection of the needle under the influence of the current. The idea was subsequently employed by Thomson in the reflecting galvanometer. Steinheil of Munich was the first to notice the important fact that by using the earth as a conductor no return wire was needed. He also invented a code of using but two elementary signals in different combinations, and an instrument for recording the characters on a moving strip of paper in the shape of two rows of dots. In America the invention of the telegraph is generally attributed to S. F. B. Morse (q.v.), though the principles on which it is based were first discovered by Joseph Henry (q.v.), who, however, failed to make any practical application of his discoveries. The electro-magnet on which the action of the telegraph depends was devised by Sturgeon of England and consisted of a piece of iron of horseshoe form surrounded by coils of wire. Henry, however, was the first to construct electro-magnets in a useful form, so that they were able to sustain considerable weights and to produce this magnetic effect by the action of a distant battery. In the Albany Academy in 1832 he had a mile of wire strung, through which he passed a current which flowing through an electric magnet caused it to attract an armature and strike a bell, thus giving an audible signal. In 1835 at Princeton, where he became professor, he used one circuit with an electro-magnet to open and close another circuit containing a battery and powerful magnet. He also had a wire stretched across the campus through which he transmitted the current, using the ground for a return. In 1832 Morse first conceived his idea of the telegraph, and for a number of years was engaged in bringing the invention to a successful outcome, it being publicly shown in 1837 in New York and other cities. In the development of the invention Morse was assisted by Alfred Vail, who was a partner in the enterprise and supplied capital as well as much of the mechanical skill necessary for the construction of the apparatus. The part of Vail in the development of the invention has been a matter of considerable contention, and in fact the whole question of the invention of the telegraph unfortunately is clouded in controversy which best can be studied by referring to a series of articles in the *Electrical World* (New York), 1895-1896, where the claims of the various inventors are set forth at some length and editorially discussed. The first *telegraph line* in commercial operation was between Paddington and Drayton, in England, in 1837, and was thirteen miles in length. This antedated by about seven years the Morse line, between Washington and Baltimore, successfully inaugurated in 1844. The printing telegraph was first suggested by Vail, in 1837, and in 1841 Wheatstone made an instrument for this purpose, though in neither case did the invention come into extended use. The Wheatstone apparatus did not work well, except over short distances, and at a very low rate of speed, being altogether inferior to the Morse telegraph. The superior efficiency of the latter in working direct through long distances was caused by the application of the relay and local circuit. In October, 1851, a convention of deputies from Austria, Prussia, Bavaria, Württemberg, and Saxony met at Vienna to decide upon a common and uniform telegraph system. It was decided that the Morse system was practically the best, and it was therefore adopted, and now this system, or a modification of it, is in general use throughout the world.

In the Morse system the temporary magnetic attraction produced when a current of electricity sent along the wire is passed through a coil was used to impart a slight movement to a lever placed near the magnet, thereby giving a visible indication each time the current was sent through the wire at the distant station. Different combinations of current, each impulse being of momentary duration, were arranged to represent the letters of the alphabet, and by this means messages were spelled out over the wire from Washington to Baltimore. This is the foundation of all electric telegraphs, though the application of the principle is modified in innumerable ways, for the purpose of permitting the transmission and the reception of messages to be done in various methods that are convenient for special places and uses. The numerous instruments so employed may be classed under two heads—namely, those which record the signals so that they may be read at any time after the message is received, and those which give only a passing signal, indicated by a sound or a motion, and which, therefore, require the constant attention of a receiving operator. Among the former are several kinds—namely, those giving a record in arbitrary signs—i.e. in the dots and dashes of the Morse alphabet; those which print the message in ordinary type, such as the modern type-printing instrument, and lastly, a class of instruments giving a facsimile of the message. See TELAUTOGRAPH.

THE MORSE TELEGRAPH. The leading principle in the Morse instruments is that by the depression of a key, or by other means, at the sending station an electric circuit is 'closed' or completed, and a signal is transmitted along the wire to a distant receiving station, where on its arrival it reproduces the signal by the action of an electro-magnet, or otherwise.

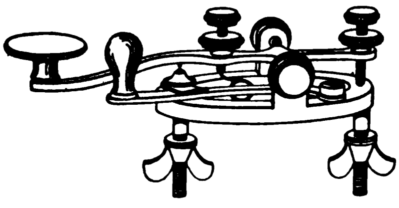
In its simplest form the Morse telegraph includes a battery or other source of current, a key to break the circuit, and a line wire connecting with a sounder or recording apparatus at the distant station, the return circuit to the battery being formed either by another wire or by the ground. To send signals in either direction a sounder and key must be provided at each station.

THE SOUNDER or receiver used is shown in the illustration, and consists of an electro-magnet of horseshoe form firmly mounted on a base. The coils are wound with insulated wire and are inclosed in cylinders of hard rubber or vulcanite. Supported by an upright casting of brass is a lever balanced on the points of two screws, which carries transversely to its length an armature of soft iron. This piece of iron is directly above the poles of the electro-magnet, so that when the current passes through the coils it is attracted with sufficient force to produce a sharp click when a screw at its end strikes the surface of the metal. By means of a spring, whose tension can be adjusted, the lever is held in such a position that the armature does not come in contact with the poles of the electro-magnet until the latter becomes magnetized by the passage of the current and attracts it. When the current ceases to flow and the core is demagnetized, the spring brings the lever back to its former position and another click results as the lever strikes a screw in the frame. If the sounder is to be used on a local circuit, as will be explained below, its resistance is generally about four ohms, but when it is on a main line where there are no relays it has a resistance of about twenty ohms, though these resistances are varied to suit conditions of line and battery or dynamo. In order to obtain a clear, loud click from the sounder it is necessary to have about one-quarter of an ampere of current flowing through the coils.



SOUNDER.

The Transmitting Key. The 'key' by which signals are transmitted from the operator at the sending office is shown below in its usual form. It consists of a lever pivoted near the middle and carrying at one end a knob by which it is manipulated by the operator in sending signals. Two platinum contacts are fastened respectively to the under side of the lever and to an insulated piece on the upper side of the base. These contacts are exactly opposite to each other, so that they come together every time the key is depressed. The lever is held up, when the key is not depressed by the operator, by a small spiral spring. One end of the line wire is connected to the sounder and then to the metallic base of the key from which the current passes through the pivots to the lever and the small contact point attached to its under side. One terminal of the battery is connected with the small insulated piece supporting the lower contact while the other goes to the ground or return wire. By this arrangement no current can pass through the line until the key or lever is depressed, since the terminal of the wire which is fastened to the contact is insulated and the current has no means of reaching the other part of the wire. When it is desired to send the current the knob is depressed, and the current from the battery, finding a passage between the two contacts, passes from one end of the wire to the other and proceeds upon the line wire to the distant station. The length of time during which the key is depressed determines the length of time between the upward and downward clicks of the sounder at the other end of the line. Thus if the operator presses down the handle and releases it quickly the keeper of the sounder will go down and up, immediately indicating a 'dot' or the letter 'E,' while if he presses the key and holds it down a moment before releasing it, there will be a longer interval between the downward and upper clicks of the sounder, and a 'dash' or the letter 'T' will be produced. In early instruments, before the operators read the messages by the clicks, the receiving instrument was arranged to make a record of the signals upon a moving strip of paper. For this purpose a pen or sharp point was attached to a lever, and a strip of paper, kept in motion by clockwork, was arranged to pass under the pen, so that a mark was produced by the pen every time the lever was pulled down by the magnet. If the lever was immediately released a dot was recorded, but if the lever was held down a moment a longer mark called a dash was produced.



AMERICAN MORSE KEY.

The signals used at first were arranged for making a record with a crude instrument of this kind, and while the increasing skill of the operators soon enabled them to read the signals directly from the clicking of the instrument without looking at the tape, the signals are still spoken of as consisting of so many dots and dashes, as if recorded on paper. These registers are to-day but little used, being seen occasionally in district telegraph stations or with fire-alarm apparatus.

The Morse Alphabet. Before going further the details of the alphabet may be given. The only elements which can be combined for making telegraphic signals in the Morse system are the dot, the dash, and the space, and the alphabet is made up of the simplest combinations of these that can be made. The preference of the shortest combinations is given to the letters most frequently used. This alphabet or code of signals, which soon became an essential of practically all forms of telegraphy, was based on the frequency with which the different letters occur. This is said to have been verified by consulting with printers and examining their type cases. The simplest signal, a dot, was given to 'E' and the next simplest, a dash, to 'T,' those letters occurring most frequently in our language. Between the separate signals of every single letter comes the space which is equivalent to a dot except in the case of C, O, R, Y, Z, when a lengthened space equivalent to two dots is used.

American Morse Characters

·	E			—	T
··	I			——	M
···	S			— — —	5
····	H			⸺	L
·····	P			⸻	cipher
······	6				
·—	A			—····	8
··—	U			—·	N
···—	V			—··	D
····—	4			—···	B
· ·	O	·—·	F	——·	G
· ··	R	· ·—·	Q	———·	!
· ···	&	· · ·—·	3	——· ·	7
·· ·	C	·—· ·	X	·——	W
··· ·	Z	· ·—· ·	2	·——·	1
·· ··	Y			· ·——· ·	"Period"
				—·—	K
				—·—·	J
				·—·—	"Comma"
				—··—	9
				—··—·	?

Owing to the fact that in some of the early telegraphs used in Europe the space could not be employed as part of any of the signals without causing confusion, it was necessary to rearrange the combinations of dots and dashes, so as to form the whole alphabet with the dot and dash without the use of the space. This alphabet is known as the Continental Morse alphabet. It is used throughout Europe and in all submarine telegraphy, having been adopted by an international conference.

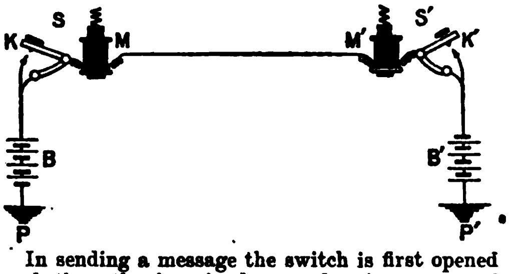
Continental Morse Alphabet

·	E	—	T
· ·	I	——	M
· · ·	S	———	O
· · · ·	H	————	Ch
·—	A	—·	N
·——	W	—··	D
·———	J	—···	B
··—	U	——·	G
···—	V	——··	Z
·—·	R	—·—	K
·—··	L	—·—·	C
·——·	P	—·——	Y
··—·	F	—··—	X
		——·—	Q
1, ·————		6, —····	
2, ··———		7, ——···	
3, ···——		8, ———··	
4, ····—		9, ————·	
5, ···		0, —————	

The Battery. For the generation of power in the electric telegraph, the gravity batteries (see Voltaic Cell or Battery) are chiefly employed in the United States. Various forms of the Daniell battery are also used, especially in Europe. The number of cells employed varies with the length of the line, the conditions of the wire as regards insulation, and the nature of the instruments used. It is quite common in the United States, especially in cities where many lines centre, to employ dynamos driven by steam engines for generating the current in place of batteries, or to make use of storage batteries.

The Circuit. The mode of joining up two or more stations by means of the line wire is shown in the figure. It being necessary to furnish a complete circuit or path for the current from the battery over the line and back to the battery, a return connection is required. In practice, this return connection is made by simply connecting the instruments at each station with the earth.

Assuming S and S′ to be the telegraph stations, with the wires grounded at P and P′ (see subsequent paragraph), B and B′ are the batteries, M and M′ the sounders, while K and K′ are the transmitting keys. The connection at the key is always completed by a supplementary switch, when the key is not being used to send a message, in order that the path may be complete for the reception of any message from the other office.



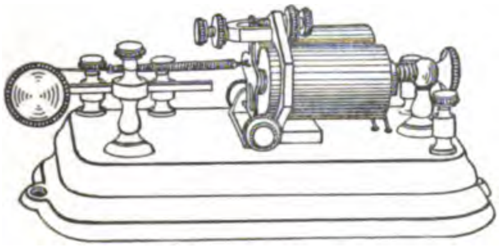
In sending a message the switch is first opened and then the key is depressed. A current of electricity will pass from the battery along the line wire, around the magnets, drawing down the armature and making a click; thence down to the earth plates and through the earth back to the battery.

The operator at the sending station in transmitting a message opens his switch and depresses his key, so as to send a series of dots and dashes corresponding to the letters to be sent to the distant station. These are heard by the receiving operator, who writes down their meaning as fast as received. The above represents the closed-circuit system, such as is employed in the United States and Canada. In the open-circuit system the current flows over the wires and through the instruments only when the sending operator depresses his key. This involves a battery at each station, which is used, however, only when signals are being transmitted.

The Line. The wire or series of wires are usually supported on poles placed along the sides of a road or railway. In cities the wires are sometimes carried over houses or in underground pipes or conduits, the conductors in the latter case being insulated by means of a gutta-percha or other suitable covering. In pole and over-house lines, the wires are kept from each other and the current from escaping to the earth by insulators of glass. In Europe white porcelain and brown stoneware insulators are used, and the former substance, when of good quality, well glazed and well burned, is perhaps the most perfect of all insulating materials, and does not deteriorate with age. The fewer the poles on which the wires are suspended, the better is the insulation and the less the cost, but the liability to accident is greater. The number of poles used varies from 30 to 50 per mile, and is governed by the number of wires carried, the configuration of the road or track, and other considerations. On road lines, the number of poles is generally larger than in the case of wires carried alongside railways, the greater level and straightness of the latter reducing the number of supports required, and thirty-five to forty to the mile is considered an average. The wire chiefly used for overland telegraph purposes is of iron, galvanized, and of No. 8 (1-8 inch) or No. 6 (1-6 inch) gauge, or copper of somewhat smaller diameter, the latter being preferred on account of its greater conductivity. The conductivity of a wire increases in the ratio of the square of its diameter (the resistance decreasing in inverse ratio), and the advantage of using a thicker wire on the longer lines is thus seen. No. 4 wire is, for this reason, used on some of the longer lines.

THE EARTH—EARTH CURRENTS. Mention has been made of the 'earth' in the preceding description. This is the technical term used in relation to the fact, discovered by Steinheil in 1838, that the earth itself serves the purpose of completing the circuit, and renders the employment of a second or return wire unnecessary. The 'earth' may consist of a buried plate of metal connected with the battery or line wire, and of sufficient surface to afford the necessary contact, with sufficient earth to make a good connection, it being understood that a small quantity of earth does not connect well. Gas or water pipes form excellent 'earths,' care being taken that the connection is made with the main pipe itself, and not with a branch, where a badly made point might spoil the connection. Where similar 'earths' are in use, as, for instance, a copper plate at one end and an iron pipe at the other, a *quasi* battery is created, and minute currents pass along the line; these, however, are too weak to be of consequence. The earth, being of great size, offers no sensible resistance to the passage of the current, in the same way that a large wire offers less resistance than a thin one. While this quality of the earth is one of the most valuable aids to telegraphy (reducing so materially the cost of wire erection), it presents at times those embarrassing interruptions known as *earth currents.* These currents, at all times unwelcome visitors to a telegraph office, are very variable, changing rapidly from positive to negative, altering their direction with the hour of the day, and leaving one circuit to appear on another in a manner not explainable.

THE RELAY. There are several methods by which the transmission of signals is facilitated or accelerated. First among these may be placed the *relay.* In the previous description of the Morse system, we have assumed the instrument to be worked directly by the current sent along the line. On long circuits, however, direct working could only be accomplished by great battery power, owing to inevitable loss by leakage, experienced by a current before it reaches its destination. Consequently what is known as a relay is used and the sounder or recording instrument is worked by a 'local current' derived from a local battery at the receiving station. This is accomplished in the following way: The receiving instrument connected to the line instead of being made heavy enough to give an audible sound by which the signal may be understood, is made extremely light and delicate so that it can be operated by a weak current.

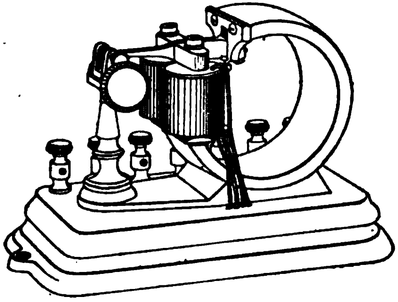


RELAY.

This relay consists of an electro-magnet wound with a large number of turns of insulated wire and an armature on a lever to which is attached a contact point which strikes another stationary contact when the lever is drawn toward the magnet, closing a circuit through these extra points in precisely the same way that the usual signaling key is worked. These contacts are connected by short wires with a regular sounder and a small battery. Whenever the lever of the relay is attracted it closes this extra or local circuit and causes the sounder to respond to every signal precisely as if it were connected directly to the main line.

DUPLEX-WORKING. The first suggestion of using a single line for more than one message was due to Moses G. Farmer of Boston, who in 1852 devised a method for this purpose and carried on successful experiments on a small scale. In 1853 Dr. Wilhelm Gintl first made use of the differential relay, and on the line between Vienna and Prague worked a method from which the modern practice of duplex telegraphy may be said to date. This system was rendered more successful in the following year by Carl Fischen of Hanover, and his invention was acquired by Siemens and Halske of Berlin, who had almost simultaneously devised a similar method. This improved system was introduced into Austria and from time to time there followed improvements devised by Stark and others. In England a duplex system was invented by Preece, while in other countries various methods from different inventors were forthcoming. In 1868 J. B. Stearns of Boston invented a system of duplex telegraphy which has since been used most successfully on many lines throughout the United States. The theory and practice of modern duplex telegraphy are somewhat complex and difficult to understand, but an outline of the principles involved may be given. In the differential method, which is largely used on land lines, there is what is known as a differential relay, that is a relay wound with two sets of coils in each of which the current flows in a different direction. Consequently when two currents of equal intensity pass through such a relay their effects are neutralized and the wire does not become magnetized. At each station a relay of this kind is provided, and there are two complete circuits, one of which includes the line wire, while the other consists of resistance coils equivalent in resistance to the line and known as the artificial line. The key and battery are common to both circuits, the points of divergence being at the relay and at the ground. If the key at one station is depressed the current will flow through both sets of coils of the relay at this station without producing any magnetizing effect, but at the distant station it will traverse but one set of coils and will accordingly cause the relay to operate the local sounder. The same thing of course holds good for the distant station. If both keys are depressed simultaneously the two batteries will combine to produce an increased strength of current flowing through one set of the differential coils of each relay, and by virtue of this preponderance of current the armature of the relay will be magnetized. A modification of this method is known as the polar duplex system and employs at each station two batteries or dynamos, so arranged that the direction of the current flowing in the line depends on whether the key is at rest or depressed. The current divides as before at the relay, which, instead of being wound differentially, is known as a poor relay. Normally the currents going to the line flow from each station in such directions that they neutralize each other, while the other portions of the divided circuit, flow over an artificial line and into the ground. Now when a signal is to be sent, the operator by means of a key or pole-changing instrument reverses the direction of the current, which passes through his relay without effect, but disturbs the conditions in that instrument at the distant station and causes an increased current in one of the sets of coils. This moves the armature and closes a local circuit, producing a click from the sounder. When both keys are depressed the currents in the two sets of coils of the relay connected with the line are neutralized as before; but the current flowing through the coils connected with the artificial line is greater and in the opposite direction, so it affects the relay and closes the circuit of the sounder. In addition to these methods there is also the bridge method, founded on the principle of the Wheatstone bridge. This method is used in the operation of the submarine cables. Duplex-working led to *diplex*, that is, two messages passing over a wire in the same direction at once, and this was followed by quadruplex and multiplex telegraphy. Quadruplex-working, whereby four messages were sent over one line, was the next development, and was first used by the Western Union Telegraph Company in 1874, and is now employed on all busy lines, particularly those between large cities. The first invention and one that has been most used was that of Edison, but improvement and new methods have been devised by Prescott, Gerrit Smith, and others.

One of the principal instruments used for the purpose of distinguishing different messages which are sent over a wire at the same time is the polarized relay, which has already been mentioned. The object of the instrument is to distinguish between messages sent with a positive current and those sent with a reversed current. Thus two such instruments can be placed in an office, connected to the same wire and adjusted so that one will respond only to the messages sent with a positive current, while the other will respond only to those sent with a negative current.



POLARIZED RELAY.

The way in which this is arranged will be seen from the illustrations. In the diagram *n s* is a hard steel permanent magnet, whose south end, *s*, has a slit in which the soft iron armature *a* is pivoted. To this armature a thin aluminum tongue, *b*, is attached, which by making contacts on either side completes either of two local circuits, and operates either of two sounders, according to which side the tongue is attracted. The coils on the magnet are so connected that a positive current attracts the tongue to one side, while a negative current attracts it to the other.

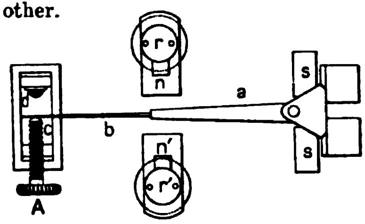


DIAGRAM SHOWING ACTION OF POLARIZED RELAY.

Automatic Transmission. The speed of the ordinary Morse instrument is limited to the rapidity with which the hand of the operator can move the key, and averages about 25 to 40 words a minute. To increase speed automatic apparatus is used which trebles, and in some cases quadruples the carrying capacity of a wire, securing at the same time mechanical accuracy in the relative size of the dots, dashes, spaces, etc. To effect this, three different instruments are required: First, there is a perforator, by which holes are punched in a paper slip to correspond with the signals required. The operator strikes three punches, the central one producing a central hole, which is of no avail electrically, only carrying forward the paper; the left-hand disk producing two holes, directly opposite to each other, on the sides of this central row, and that on the right producing two holes, placed diagonally to each other. The passage of the electric current is regulated by the position of the outer holes; those opposite each other admit of a momentary passage of the current through the second portion of the instrument, i.e., the 'transmitter,' which is used in sending the message, while the holes diagonally placed produce a lengthened mark corresponding to the dash. The following diagram represents the word 'and,' as shown on the punched slip:

```
oo    o  o  o  oo
oooooooooooooooo
 o  o   oo   ooo
```

PUNCTURED TAPE.

This would be printed

.— —. —..
a n d.

The third portion of this instrument is the 'receiver,' in which the currents sent by the action of the punched slips in the transmitter are reproduced in the dots and dashes of the Morse code—the printing being, moreover, done with a mathematical accuracy which keying by hand cannot attain. The speed of transmission depends on the length of the line and state of the atmosphere; but the movements of the clockwork, both of the transmitter and receiver, are capable of adjustment to any speed below 120 words per minute.

A system of multiplex telegraphy invented by Delany and employed in Europe provides for the simultaneous transmission of a number of messages either in the same direction or part in one direction and the remainder in the opposite direction. The apparatus consists of a number of contact pieces arranged on a circular disk or table, some of which are connected with the separate sending or transmitting instruments, while others are connected with local relays and batteries and the ground. A trailer or rapidly revolving arm connected with the line wire passes over these contact points so that the circuit is successively completed through the different instruments at one station, while a similar device at the other station, revolving synchronously with the first, makes connections with an equal number of instruments. The speed of revolution of the trailers is regulated by two tuning forks or vibrating reeds of the same pitch, and an ingenious synchronizing device keeps them always in unison. In this way it is possible to operate twelve different sets of Morse transmissions over one wire, and it is accomplished in the following manner. The first operator closes his key, and as the trailer passes around, it will make contact with the line wire and his instrument will be connected about 36 times in one second, thus transmitting that number of impulses. Now, if he desires to send a signal corresponding to a dot, he would close his key for a brief interval, which may be one-twelfth of a second, thus allowing three impulses of current to be transmitted over the line wire to the corresponding instrument at the other station, which is only in a position to receive the signals from the one transmitter. The same is true for the other operators and their instruments, each one employing the wire for a certain fraction of the time. Numerous other systems have been devised, important among which is the multiplex printing telegraph of Rowland, which has been successfully used in Europe. It employs an alternating current and four transmitters and receivers can be used in connection with one wire. There is a mechanical keyboard somewhat similar to that of a typewriter, while the signals are received and printed on a tape or upon ordinary letter pages in 'typewriting' characters.

In the United States the telegraph is entirely in the hands of private companies. The first company was organized in 1845 under the name of the Magnetic Telegraph Company by Morse's supporters and associates. In that year the telegraph was constructed between Philadelphia and Morristown and in the following year it was extended to New York. The House printing telegraph was patented in 1846, and soon after numerous companies were formed to exploit both systems. This was the case all over the United States, and soon the competition became most sharp and the lack of thorough organization apparent. In 1856 the Western Union Company was formed by the Erie and Michigan Telegraph Company uniting with the New York and Mississippi Valley Printing Telegraph Company. From this time combination and consolidation was carried on, the efficiency of the service increasing continually. In 1862 the telegraph across the North American continent was completed and in operation. By 1866 consolidation had taken place to such an extent that there were three telegraph companies which enjoyed the largest part of the business in the United States. These were the Western Union, the American Union, and the United States. In 1881 the Western Union absorbed the American Union and the Atlantic and Pacific, and at later periods purchased or leased the lines of the New York Mutual Telegraph Company, the Baltimore and Ohio Railway Telegraph, American Rapid Telegraph, and the Northwestern Telegraph Company, all of which are now operated as part of the Western Union system. The telegraph business of the United States is at present controlled by the Western Union and Postal Telegraph-Cable companies. The former in 1901 had 193,589 miles of poles and cable, 972,766 miles of wire, 23,238 offices, transmitted 65,657,049 messages, had receipts aggregating $26,354,151, expenses amounting to $19,668,903, and profits of $6,685,248. The average toll per message in 1870 was 75.5 cents, while the cost of transmission was 51.2 cents. In 1900 these figures were 30.8 cents and 25.1 cents, respectively.

The Postal Telegraph-Cable Company in 1901 had in its system 43,850 miles of poles and cables, 243,423 miles of wire, 14,870 offices, and transmitted 17,898,073 messages.

LAND TELEGRAPH SYSTEMS OF THE WORLD (1902)

STATEMENT SHOWING MILEAGE OF LINES AND NUMBER OF MESSAGES DELIVERED IN EACH COUNTRY OF THE WORLD; ALSO THE NUMBER OF MESSAGES PER CAPITA

COUNTRIES	Miles of lines	No. of messages sent	Messages per capita
United Kingdom	46,295	89,576,961	2.15
United States	219,938	83,555,122	1.08
France	90,170	48,144,151	1.25
Germany	81,303	38,342,455	.68
Austria-Hungary	47,304	29,427,615	.65
Russia	98,570	18,376,969	.14
Japan	14,734	16,737,150	.38
Commonwealth of Australia	44,501	8,987,846	2.39
New Zealand	7,249	9,898,128	5.05
Italy	26,427	7,896,061	.24
Belgium	3,975	*14,411,487	2.15
Spain	19,885	†5,058,104	.28
Argentina	27,584	3,427,664	.71
India	52,909	6,237,301	.03
Netherlands	‡3,831	‡5,393,872	1.04
Mexico	§32,486	2,604,710	.19
Canada	35,628	5,181,680	.96
Switzerland	5,698	3,950,162	1.19
Turkey	23,440	3,624,775	.14
Bulgaria	3,270	1,356,041	.36
Egypt	2,365	4,250,571	.44
Rumania	4,344	2,224,539	.38
Cape Colony	7,467	3,562,039	1.51
Sweden	5,958	2,580,258	.50
Denmark	‡2,413	‡2,317,979	.94
Norway	¶9,040	2,267,915	1.01
Portugal	5,180	3,420,453	.63
Brazil	12,630	2,662,711	.02
Chile	14,592	‖1,286,936	.41
Greece	**5,300	1,771,506	.73
Servia	2,550	1,079,435	.43
Guatemala	3,400	796,192	.51
Cuba	2,300	....	......
Uruguay	4,601	397,493	.42
Colombia	8,600	††555,000	.14
Persia	4,800	152,837	.08
Peru	1,983	121,492	.03
Paraguay	600	83,560	.16
Venezuela	3,882	....	......

* Including official dispatches. † Including international and official messages. ‡ State offices and State lines, respectively, only. § Of which 19,085 miles were owned by the Federal Government. ¶ Including telephone lines and wires. ‖ Sent over State lines only. ** Including submarine lines. †† Estimated.

In striking contrast to the system of private companies of the United States is the governmental control of the telegraphs as practiced in Great Britain and other European countries. In Great Britain previous to 1870 the telegraph business was controlled by private corporations, but in 1868 a bill was introduced into Parliament and passed in the following year whereby the lines and property were acquired by the Government at an expense of £6,750,000. In 1869 there were about 7,000,000 messages sent, a number which increased to 22,459,775 in 1879, and 90,415,123 in 1900. In this last year the receipts from telegraphs were £3,460,492 and expenditures £3,748,930, leaving a deficit of £288,438. This deficit is due largely to the reduced rate at which newspaper messages are transmitted, there being an actual loss of over £250,000 on this class of business. With governmental ownership have come improved service and reduced rates. Where in 1870 it cost from 3 to 6 shillings to send a message from London to Dublin, now a message of 12 words can be sent anywhere in the United Kingdom for 6 pence. In 1867 the average charge for a message was a little over 50 cents; now it is slightly more than 15 cents. In 1900 the Post-office Department controlled 11,188 telegraph offices, including 2337 railway offices, while the mileage of line is stated at 44,970, with 329,660 miles of wire.

Bibliography. Houston and Kenelly, *Electric Telegraphy* (New York, 1896); Loring, *A Hand Book of the Electro-Magnetic Telegraph* (New York, 1900); Maver, *American Telegraphy: Systems, Apparatus, Operation* (2d ed., New York, 1899); id., *Quadruplex, with Chapters on the Dynamo Electric Machine in Relation to the Quadruplex* (New York, 1893); Pope, *Modern Practice of the Electric Telegraph* (16th ed., New York, 1899); Prescott, *Electricity and the Electric Telegraph* (New York, 1892); Culley, *Handbook of Practical Telegraphy* (8th ed., London, 1885); Preece and Sivewright, *Text Book of Telegraphy* (9th ed., London, 1891); Bright, *Submarine Telegraphy* (London, 1898); Reid, *History of the American Telegraph* (New York, 1882). See also Atlantic Telegraph; Telegraphy, Submarine; and Wireless Telegraphy.

TELEGRAPHERS' CRAMP. See Neurosis.

TELEGRAPHY, Submarine. In submarine telegraphy there are many variations from the practice on land lines. (See Telegraph.) This is the case because the length of the line between stations is usually great and certain conditions attend the construction and laying of the cable bearing the conductor. The problem then involves the transmission of current along a conductor of great length and necessarily small cross-section with of course considerable resistance. In a long cable we have to consider the effect of the electrostatic inductive capacity as well as its conductivity. The cable acts as a condenser (q.v.), the core or conducting surfaces, while the metallic sheathing acts as the other. As it takes a perceptible time for the cable to be charged and discharged when a current is sent through it, there is a certain limit to the speed of transmission of signals without their becoming confused and unintelligible. As the length of the cable increases, so does the time required for charging, and it was demonstrated by Lord Kelvin (1853) that the rate of signaling would vary inversely as the square of the length of the cable. So small is the current passing over the cable that it is impossible to use ordinary telegraph instruments on lines greater than 500 miles in length, and only up to 150 miles can an ordinary rate of signaling be maintained. It is necessary, therefore, to use some sensitive device such as a mirror galvanometer or a Thomson siphon recorder to receive the transmitted signals. The galvanometer (q.v.) or some modified or special form of this instrument when used in cable telegraphy is of high resistance and considerable sensitiveness. The ordinary mirror receiver resembles the Thomson reflecting galvanometer, and has one coil and a suspended mirror to which the magnets are attached. The action is precisely the same as in the galvanometer, the amount and direction of the deflection depending on the intensity and direction of the current. A galvanometer with a suspended coil may also be used, or, what is more usual, some form of siphon recording receiver. The siphon recorder was invented by Lord Kelvin in 1867 and has since been greatly modified and improved by various cable engineers. It consists essentially of a coil of light wire suspended between the poles of a powerful magnet, capable of being deflected from its position of rest upon the passage of a current. As the coil moves its motion is transmitted to a siphon formed by a fine glass tube, one end of which dips into a vessel containing ink, while the other is near or in contact with a strip of paper which is moved through the apparatus by a motor, either electrical or clockwork. This glass pen will trace on the tape a line where the movements of the coil are indicated by curves or waves marked on the paper. These curves are above or below the line of rest, depending upon the direction of the current which passes through the coils. Thus to produce a dot a positive current is sent over the wire and an upward curve is produced on the record. Reversing the current gives a dash, and employing the Continental Morse alphabet described under Telegraphy, the various signals can be transmitted. With such recorders are employed either simple keys or automatic transmitters. The simple key consists of a pole-changing device by which a current in either direction can be sent over the circuit by simply pressing one of two keys. In automatic transmission, which is used on the transatlantic cables and other busy lines, the operator first punches in a paper strip holes corresponding to the proper signals, and then contact is made through the agency of rods or brushes as the tape is passed through the transmitter. These devices, however, can only be used on cables having heavy cores, but by their use a rate of 50 words or more a minute may be obtained.

In working cables it was soon found that their efficiency was increased and the effect of earth currents eliminated by inserting a condenser (q.v.) between the transmitting instrument and

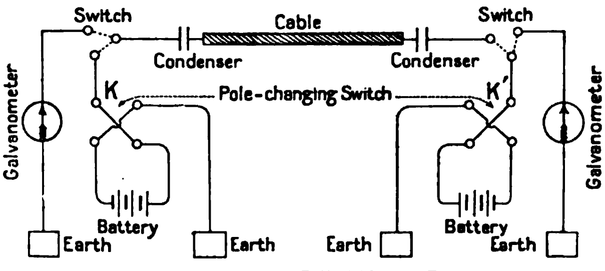


DIAGRAM OF SIMPLE CABLE CIRCUIT.

the line. This idea, originated by C. F. Varley, was embodied in a patent in 1862 and put in practice in 1866. When first used at the receiving end it was found that the speed was considerably increased, and when placed at both ends the efficiency of the cable was practically doubled. Greater distinctness in the transmission of the signals was obtained as well as increased rapidity. The operation of a simple cable circuit will be seen from the preceding diagram of the connections.

The cable connected with a condenser at either end is shown above. From the opposite plates of the condenser connection is made with a switch through which the current may pass either to the earth through a galvanometer or recorder or to a transmitting key, K, and then to the battery and earth, depending on whether signals are being sent or received at the particular station. At K and K′ either pole of the battery can be connected at will to the line, or rather to the condenser, and the cable charged inductively. The corresponding signals are produced at the distant station, the galvanometer being connected to the line by the switch. Cables can also be worked duplex with facility and an increased speed of 90 per cent. attained, but as yet it is not possible to employ the quadruplex method in use on land lines. The duplex system was devised in 1875 and 1876 by Muirhead and Taylor and was first used on the Atlantic cable in 1878. Previously in 1873 experiments in this field had been carried on by J. B. Stearns.

HISTORY AND STATISTICS. The feasibility of laying a line for the transmission of signals along the bottom of the ocean seems to have been first suggested in 1795 by a Spaniard named Salvia. Eight years later a nephew of the famous electrician Galvani performed experiments of a similar nature in the deep sea off Calais. The first really important experiments, however, bearing directly upon this subject are believed to have been those of Sömmering and Schilling, who in 1811 applied a soluble insulating material to a conductor which was laid across the river Isar near Munich. These investigators also used a submarine conductor to explode gunpowder by an electric current. In 1813 an Englishman named John Sharpe transmitted signals through seven miles of insulated copper wire laid on the bottom of a pond, but the first practical attempt to use such a conductor to transmit telegraphic signals was by Colonel Paisley of the Royal Engineers at Chatham, England, in 1838. He surrounded his conductor with strands of tarred rope and wrapped the whole with pitched yarn. In 1839 Dr. W. O'Shaughnessy at Calcutta laid across the Hugli River copper wire covered with bamboo and then coated with cotton and tar. In 1840 Wheatstone proposed a scheme similar to those of the last two inventors, and later suggested the use of gutta-percha as a covering for the wire, but was unable to put his idea into practice. Prof. S. F. B. Morse, of New York, laid an insulated cable between Castle Garden and Governor's Island, and as a result of his experiments came to the conclusion "that a telegraphic communication on his plan might with certainty be established across the Atlantic." The idea that submarine conductors for telegraphic purposes could be constructed was rapidly taking root, and in 1845 the Messrs. Brett, who were active in the construction of the first telegraphic lines across the English Channel and the first Atlantic cable, registered a 'General Oceanic Telegraphic Company' for the purpose of establishing telegraphic communication between England and America. In 1850 an experimental line was laid across the English Channel by the Messrs. Brett, and this was followed in 1851 by a permanent cable of such excellent construction that it survived for a number of years. Several longer lengths of submarine cable were laid within the next few years. Italy was connected with Corsica and Sardinia, and Sardinia with Africa. A Black Sea cable was laid in 1855, but operated only a short time.

Thus far attempts to lay submarine telegraph lines had been confined to comparatively short distances. In 1858, after repeated unsuccessful experiments, telegraphic communication was established across the Atlantic. After something over a hundred messages had been sent back and forth, the cable ceased to work. Although this cable was a comparative failure, yet its brief success proved two things: (1) That a cable could be laid through 3000 miles of deep sea; (2) that the electric current could be transmitted through a wire of that length. It was not until 1866 that a permanent cable was laid across the Atlantic. (The detailed history of this undertaking is described under ATLANTIC TELEGRAPH.) A second Atlantic cable was inaugurated immediately after, the one which had broken in the laying in 1865 having been repaired. In 1859, after the first Atlantic cable had ceased to work, the Red Sea and East Indian Telegraph was laid, over a route 3043 miles long, but this also proved a dismal failure and was finally abandoned. The Malta-Alexandria cable was laid in 1861, and was in use till 1872, when, from repeated breakages in shallow water, its use was discontinued. The core consisted of a strand of seven copper wires, covered by three layers of gutta-percha; outside of this was a serving of tarred yarn; and, finally, 18 iron wires constituted the sheathing. This was the first long cable successfully laid (its total length, in three sections, being 1331 miles); and it was also the first properly tested under water before being laid, and carefully constructed with constant watchfulness as to its electrical and mechanical conditions. In 1869 a cable 2328 miles long was laid from Brest, France, to the island of Saint-Pierre, south of Newfoundland; in 1873, one from Lisbon to Pernambuco, Brazil. In 1874 a third British Atlantic cable was laid, from Ireland to Newfoundland, and in 1875 a fourth, from Ireland to New Hampshire. In 1903 there were 19 cables across the Atlantic, of which three were no longer in use. Of these, two distinct lines, one of which is duplicated, connect Europe with South America.

In 1902 the British Pacific Cable between Australia and British Columbia, 7800 nautical miles in length, was completed, and in 1903 the first American cable was laid across the Pacific, with a length of 7846 nautical miles, by the Commercial Cable Company, between San Francisco and the Philippines, touching at Hawaii, Midway Island, and Guam. In 1903 the total length of submarine cable was estimated at over 250,000 miles, representing an outlay of over $300,000,000.

Construction of Cable. A submarine cable consists of three parts: (1) The central conductor, or core, to carry the current. This is made of copper wire, either solid or in strands. (2) A covering of insulating material to prevent the current from being dissipated. This is usually made of gutta-percha, although recently, in submarine telegraphy in the Philippine Islands, rubber has been used instead. (3) An outer covering to protect the insulating material from injury. This is usually of yarn, tape, or canvas. The cable is generally divided into three sections: the deep-sea section, the intermediate portion, and the shore end. The last portion has to be constructed with greatest care and strength, as in shallow water there is more danger of injury from rocks and other causes. It is estimated that a deep-sea cable weighs about one ton per nautical mile. Cables cost from $350 in deep sea to $1500 at the shore end per mile. The cost of maintenance is often heavy and requires the services of a fleet of vessels.

Bibliography. Consult Bright, *Submarine Telegraphy* (London, 1898), a thorough and interesting treatment of the subject from both the historic and scientific sides; also, "Submarine and Land Telegraph Systems of the World," in *Monthly Summary of Commerce and Finance of the United States,* July, 1903 (Washington, Treasury Department).

TELEGRAPHY, Wireless. See Wireless Telegraphy.

TEL EL-AMARNA, tĕl ĕl-ȧ-mär′nȧ. A place in Middle Egypt, on the right bank of the Nile, about midway between Thebes and Memphis. It includes the Arab villages Hagg-Kandil and Et-Tell and is the site of the ancient city of Khut-Iten (Horizon of the Sun), founded by the heretic King Amenophis IV. (q.v.), who abandoned Thebes and removed his residence thither. A splendid temple and palace were built, and the city increased so rapidly that it soon extended to the opposite bank of the Nile; but it had only a brief existence. After the death of Amenophis and the triumph of the orthodox religion, the royal residence was transferred to Thebes and the new city fell into decay as rapidly as it had risen. Fifty years after its foundation it was in ruins, and has never since been inhabited. The ruins of the temple and palace are still to be seen, and in the vicinity are a number of interesting rock-hewn tombs, richly adorned with sculptures and paintings, constructed for the courtiers of the royal founder of the city. In the winter of 1887-88 the archive chamber of Amenophis was discovered by some natives, and in it were found a number of cuneiform tablets containing the Asiatic correspondence of the King and of his father, Amenophis III. (See Amarna Letters.) The site was explored by Petrie in 1891-92. Consult Petrie, *Tel el-Amarna* (London, 1897); Baedeker, *Aegypten* (Leipzig, 1897).

TEL EL-KEBIR, tĕl ĕl kȧ-bēr′. A village of Northeastern Egypt, on the Sweet Water Canal, 18 miles east by south of Zagazig, noted as the scene of a battle between the English under Lord Wolseley and the Egyptian insurgents under Arabi Pasha (q.v.), September 13, 1882. See Egypt.

TELEMACHUS, tē-lĕm′ȧ-kŭs (Lat., from Gk. Τηλέμαχος). In Greek legend, the son of Odysseus (see Ulysses) and Penelope (q.v.). At the opening of the *Odyssey* he is represented as led by Athena in the guise of Mentor, a trusted Ithacan friend of Odysseus, in search of tidings of his long-absent father, since he was unable alone to expel the insolent suitors of his mother. Having visited Pylos and Sparta, Telemachus returned home to Ithaca, where he found his father in the guise of a beggar, at the hut of the faithful swineherd Eumæus. After Odysseus had revealed his identity to his son, they carried out a plan for the slaying of the suitors. In post-Homeric legend it was told how, after the death of Odysseus, Telemachus and his mother accompanied Telegonus to the island of Circe, where Telegonus wedded Penelope, and Telemachus Circe.

TELEMACHUS. A Syrian monk who in A.D. 404 leaped into the arena of the Coliseum during a gladiatorial combat, attempting to separate the contestants. He was stoned to death, but his heroic protest led Honorius to suppress gladiatorial fights; at least there is no evidence of their taking place after this time.

TÉLÉMAQUE, tā′lā′mȧk′, Aventures de (Fr., Adventures of Telemachus). A romance, with some political significance, by Fénelon (1699), founded on the adventures of the son of Odysseus and largely influenced by Barclay's *Argenis* (q.v.). The principal character represented the author's conception of an ideal youth and was meant as a model for his pupil, the son of Louis XIV.

TELEMETER (from Gk. τῆλε, *tēle*, afar + μέτρον, *metron*, measure). An instrument for measuring the distance to a remote object, used in surveying and in military operations by engineers and artillerists. In the Boulenge telemeter, the distance from the observer to a cannon or exploding shell is ascertained by measuring the time consumed by the sound in reaching the ear. There are many forms of telemeter, which consist for the most part of telescopes and mirrors by means of which angles can be read and the distance computed. Gautier's telemeter is a type of this class of instruments, and depends upon the double reflection of a beam of light, as in the case of the sextant, and the measurement of a short base line at the point of observation. The telemeter of the United States Coast and Geodetic Survey is more generally known among American engineers as the stadia (q.v.), and in Great Britain as a tachometer. It consists of a mounted telescope with two extra horizontal cross wires that intercept a certain number of divisions on the image of the graduated rod held upright at the distant point. The distance of the rod from the instrument is obtained by multiplying the reading by a constant factor which depends upon the construction of the telescope. Stadia measurements are particularly useful in making a rapid survey or reconnaissance and are accurate to about one part in 700. The name telemeter is also applied to an instrument which is connected electrically with indicating apparatus such as a meter or gauge and furnishes a similar record at a distant station. See Range-Finder. Consult Baker, *Engineer's Surveying Instruments* (New York, 1892).

TELEOLOGY (from Gk. τέλος, *telos*, end, completion + -λογία, *-logia*, account, from λέγειν, *legein*, to say). A term used in philosophy to denote any theory which explains the world as in some way controlled by intelligent purpose. The question teleology answers in the affirmative is whether in the universe as a whole, or even in the phenomena of terrestrial organic life, there is some actually conscious being controlling the cause of events and shaping it to the realization of preconceived ends. It is certain that the tendency to interpret actions teleologically appears in very early childhood. But as the child grows older he has a right to criticise the interpretation he previously gave to these actions. The mere fact that it is natural for him in early childhood to do a thing is no proof that in mature life he is justified in continuing to do that thing. The criticism he gives to his early personifications results in the confirmation of some. He is confirmed, for example, in his conviction that all normal human beings have much the same mental constitution and much the same conscious control over their actions as he. But the increase in knowledge, which bears out his early interpretation of the actions of human beings, tends to discredit much of his interpretation of other phenomena. Fetishes tend to disappear with mental culture, while, in regard to the animal world, the child-fashioned, rough-and-ready explanation of instinctive action as consciously purposed has become obsolete in scientific circles. But tne depersonifying tendency of scientific knowledge has been generally offset by the attempt to attribute to the universe at large a purpose which many individual parts of the universe are no longer alleged severally to show.

In fact, in its metaphysical aspect the question is removed to a plane where science and scientific considerations are only of secondary importance. In the old argument that the natural world reveals adjustments which could only have been provided for by the foreseeing wisdom of God, the teleological hypothesis was a form of scientific theory—that is, it was as much a description of the course of events as an interpretation of their causes. As treated in its broadest scope, however, teleology becomes an interpretation of the facts which it is the business of science to describe. Teleology is an interpretation of a particular kind; it argues that the facts which science describes can be adequately accounted for, causally, only by the assumption of an intelligent purpose of which human purpose furnishes the only analogy which we can understand. This does not mean that the purpose of the universe must be like human purpose, but that a purpose resembling human purpose is all that can make it intelligible to us.

Teleology, in this sense, and scientific theory in no way conflict. As a matter of fact, they are based upon very different rational principles. Science proceeds in its explanations upon the law of parsimony (q.v.), assuming the fewest possible hypotheses for the maintenance of its structures; teleology, on the other hand, proceeds on the principle of sufficient reason, which requires the fullest and most satisfactory explanation of phenomena as the probable truth. Again, science is primarily concerned only with the delineation of phenomena, with description of fact; teleology strives to discover a significance in these phenomena and facts which shall satisfy all the needs of the human mind. The same facts are dealt with in each case, but the form of their consideration is entirely different. This may be illustrated in the case of the doctrine of evolution, which, for science, is simply the specific statement of certain hypotheses—as, for example, the struggle for existence, the law of the survival of the fittest, etc.—which are supposed to describe the actual descent of animals; teleologically, however, evolution is viewed as a process planned and controlled by a foreordained intelligence analogous to ours. Frequently scientific theory, as in this case, contains elements of teleology, but this is due rather to the failure of exact description than to the proper character of scientific treatment. There is no logical interconnection of science and teleology and no possibility of any real contradiction between them. See MATERIALISM; MECHANISM.

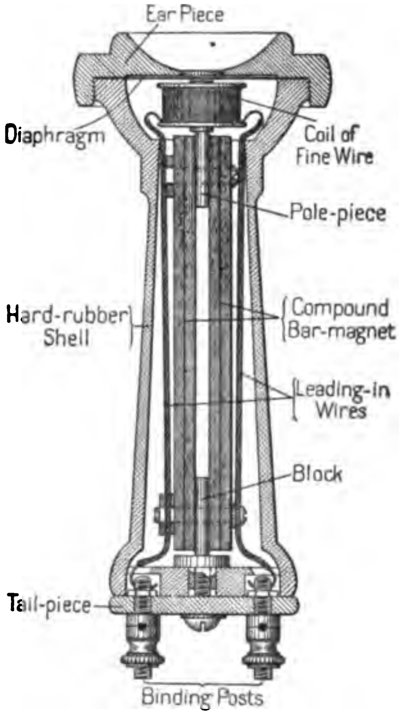
TEL'EOSAU'RUS (Neo.-Lat., from Gk. *τέλεος*, *teleos*, *τέλειος*, *teleios*, complete + *σαῦρος*, *sauros*, lizard). An extinct crocodile, fossil skeletons of which are found in the Jurassic rocks of Europe. The animal was small and had a much elongated tube-like snout armed with numerous small outward-curving teeth. The body was covered by tuberculated scutes. See CROCODILE.

TELEP'ATHY (from Gk. *τῆλε*, *tēle*, afar + *πάθεια*, *-patheia*, from *πάθος*, *pathos*, feeling). A term coined by members of the Society for Psychical Research: "We venture to introduce the words Telæsthesia and Telepathy to cover all cases of impression received at a distance without the normal operation of the recognized sense organs." (See PSYCHICAL RESEARCH, SOCIETY FOR.) E. Gurney, F. Myers, and F. Podmore in *Phantasms of the Living* (1886) say that "under particular conditions of excitement—the rationale of which we probably do not understand, though insensibility and the near approach of death are apparently some of the most effectual of these conditions—certain persons seem to have the faculty of communicating to other persons at a distance what is happening to them, often without any intention or consciousness of doing so on their own parts," and further, that "certain small experimental results can be produced," and that "certain impressive spontaneous phenomena are shown to belong to the same class." It seems now to be clearly enough demonstrated that only the experimental results are worthy of attention. There are many accounts of telepathic phenomena of earlier date. Thus the hypnotized subjects of Mesmer were said to have frequently obeyed the *silent* will of the operator; but all such reports are useless as evidence, on account of the lack of sufficient data, the neglect of suitable precautions, and the ignorance of the extreme suggestibility of the hypnotic subject. So, too, the countless stories as to the feats performed in the popular game of 'mind-reading' are of little significance, once the possibilities of 'muscle-reading' are clearly understood. The actual evidence upon which telepathy now rests is of an extremely fragmentary nature. It may be classified as (1) experimental, the communication from 'agent' to 'percipient' of simple visual impressions—diagrams, and color, suit, and number of playing cards, etc.; (2) certain striking cases of the induction of sleep at a distance, notably that of Madame B. or 'Léonie,' reported by J. Ochorowicz; (3) statistics of what are known as 'veridical hallucinations,' i.e. apparitions of a person to some distant friend at the time of the person's death; (4) the performances of certain 'test mediums,' especially of one, Mrs. Piper, whose case has been investigated at length by the Society for Psychical Research. (See their *Proceedings*, 1890, 1892, 1895.) All this evidence rests upon the assertion that the number of coincidences exceeds the number attributable to chance according to the law of probability; e.g. veridical hallucinations are said to be 440 times more numerous than they should be according to chance alone. The verdict of science is still, however, 'not proven.'

BIBLIOGRAPHY. *Proceedings Society for Psychical Research, passim;* Beard, *The Study of Trance, Muscle-Reading, and Allied Nervous Phenomena* (New York, 1882); Jastrow, *Fact and Fable in Psychology* (Boston, 1900); Flammarion, *The Unknown* (Eng. trans., New York, 1900); Ochorowicz, *De la suggestion mentale* (Paris, 1887); Parish, *Zur Kritik des telepathischen Beweismaterials* (Leipzig, 1897); Podmore, *Apparitions and Thought-Transference* (New York, 1895).

TELEPHONE (from Gk. *τῆλε*, *tēle*, afar + *φωνή*, *phōnē*, voice, sound). An instrument for the transmission of speech or musical or other sounds by means of electrical vibrations corresponding to the original sounds. The first use of the word telephone is in a description of experiments by Wheatstone where sound was transmitted through wooden rods. In 1837 Page, of Salem, Mass., noticed that an iron rod suddenly magnetized and demagnetized would emit certain sounds which were due to a rearrangement of the molecules, and this phenomenon has since been known as Page's effect. Bourseul of France in 1854 conceived the fundamental idea of the telephone, but did not, however, put it into actual practice. He proposed a device in which a current interrupted by a vibrating disk under the influence of the voice would produce a similar vibration of a disk at the end of a conductor through the agency of an electro-magnet. In 1860 Philipp Reis, of Frankfort, invented an apparatus which he named 'Telephone,' with which he was able to reproduce sound at a distance. Reis's telephone, about which there has been much controversy, in his hands at least was able to transmit articulate speech, and he is entitled to credit for the principle of the instrument. For the practical development of the idea and the invention of an actual working telephone the honor must be given to Alexander Graham Bell, who, March 7, 1876, received letters patent for new and useful improvements in telegraphy in which a method for the transmission of vocal sounds is one of the most important of the claims. Few patents for inventions have been subject to more litigation than the telephone, and the literature on the subject is quite exhaustive; but Bell's rights have been sustained by the highest courts, and though he was closely followed by other inventors, notably Elisha Gray, he may fairly be entitled to the honor of the invention.

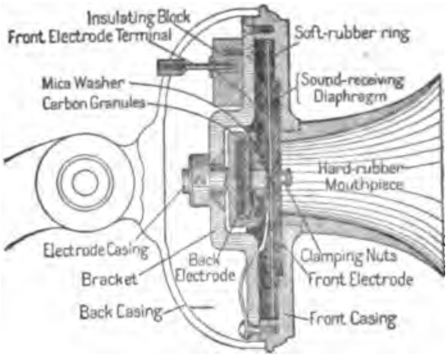
The Bell telephone, which has survived as the modern receiver, served both as transmitter and receiver in the early apparatus. A reference to the accompanying diagram showing a cross section of a modern unipolar receiver will make clear its action. There is a hard rubber case hollowed at its upper extremity and containing the soft iron diaphragm about $\frac{1}{100}$ inch thick and two and a quarter inches in diameter, with free part one and three-fourths inches across, which is tightly held at its circumference, but its centre is free to vibrate. A bar magnet, either single or compound, carries at its upper end a coil of fine silk-covered wire (No. 38 B. & S. gauge generally) with resistance of about 75 ohms, whose terminals connect with the binding posts. A more powerful receiver can be constructed by employing instead of a single magnet a horseshoe magnet with coils on each pole. In the Ader bipolar receiver, used extensively in Continental Europe, the horseshoe magnet is ring-shaped and outside of the diaphragm, and in front of the pole pieces a soft iron ring is placed with the object of strengthening the field of force between the poles. The diaphragm of a telephone receiver is in close proximity to the pole or poles of the magnet, but not in contact. When used as a transmitting instrument this diaphragm will vibrate under the influence of the voice, its movement being caused by the movement of the air known as sound waves. The diaphragm rapidly approaching and receding from the magnet consequently produces currents by induction in the wire of the coil. These currents will be transmitted over the line wire, and, flowing through the coil of the receiving instrument, will cause its magnet to become more strongly magnetized and the diaphragm to be attracted. The diaphragm of the receiver will accordingly move in unison with that of the transmitter, and consequently the sound wave which impinges on the latter will be reproduced. The ground can be used as a return or the circuit can be of wire throughout. The currents of electricity that were transmitted



SECTION OF RECEIVER WITH COMPOUND UNIPOLAR MAGNET.

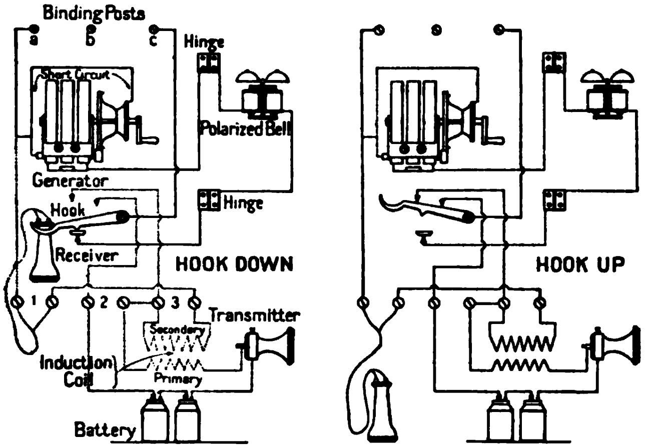
in this way were too feeble to produce satisfactory sounds at the receiving instrument when there was a line of any considerable length, and it was necessary to find a better transmitter. Accordingly there followed the carbon transmitter, where the change of resistance of carbon under pressure produces pulsations in the current corresponding to the vibration of the sound waves.

Previous to this, however, came Elisha Gray's transmitter, consisting of a needle mounted at the centre of a vibrating diaphragm and dipping into a liquid of rather low conductivity. The current passed through the needle and the liquid and the resistance of the circuit varied with the vibration of the diaphragm. This transmitter allowed variable but continuous currents to pass, and did not interrupt them entirely, as did the transmitter of Reis's telephone. The next transmitter was that of Berliner (1877), based on the variation of resistance with pressure, a diaphragm vibrating in contact with a metal knob; and then came that of Edison, where a button of compressed carbon was in contact with a small disk of platinum on the diaphragm. The microphone of Hughes (1878), where two bodies are in loose contact, has furnished the type of modern transmitters, where the carbon is in the form of finely divided granules held between two conducting plates, one of which is the diaphragm on which the voice strikes. The Edison form was, however, used for a number of years, but the Hunnings form or some modification was found necessary when long-distance telephoning came into practice. With such transmitters it was found necessary to introduce a secondary circuit instead of having the varying currents flow in the main circuit as was the case originally. The change in resistance then was small in comparison with the total resistance of the circuit and the effect on the receiver was not as marked as desired. Accordingly Edison conceived the idea of using an induction coil in the circuit with the transmitter. This induction coil consists of a primary coil with a few layers of coarse copper wire wound around a bundle of soft iron wire and a secondary coil of a large number of turns of fine wire. The diagram below, where the receiver has been removed from the hook (hook up), shows the general arrangement of the circuit. The current from the battery flows through the transmitter and the primary of the induction coil. Any difference of intensity in current caused by a change of resistance in the transmitter will give rise to induced currents in the secondary, which will affect the receiver correspondingly, and the original vibration of the sound waves will be reproduced. The addition of the coil renders the apparatus far more sensitive and the increase in voltage caused by the many turns of the secondary enables the sound to be transmitted to a much greater distance. The Blake transmitter, the invention of Francis Blake, of Boston, was used in the United States almost universally until the adoption of the transmitter with the granulated carbon, and is familiar in the older instruments, being incased in a wooden box. Its action depends upon the pressure on a button of a compressed carbon by a point in connection with a metal diaphragm. The transmitter in most general use at present is the White or solid back transmitter, illustrated in the accompanying diagram. The construction of the transmitter will appear from the diagram. Between two disks of carbon is placed granular carbon. One disk is in contact with the solid back of the instrument, while the other is in contact with the diaphragm on which the sound waves impinge. The back of the transmitter forms one electrode, while the front plate is insulated from the rest of the apparatus and is connected with the other conductor. There are numerous other forms of transmitter which are constantly increasing with the extending use of the telephone for interior use and by independent companies. These transmitters require batteries, of which the Leclanche, some form of dry cell, or the Fuller bichromate of potash cell are generally employed, while for central stations and wherever possible storage cells are very desirable and useful.



WHITE SOLID BACK TRANSMITTER.

With the telephone must be included some sort of call-bell, and for this purpose a magneto-bell is usually employed. This consists of a small magneto-generator in which the armature is revolved by a few turns of a crank and a current of considerable voltage (that is, compared with the battery) is transmitted to the distant station, where there is what is known as a polarized bell. The current transmitted is alternating and the bell used is of the polarized ringing form, where the armature is alternately attracted by one pole and the other, depending on the polarity of the passing current. In the older form of circuit still in use in many exchanges where the central station must be called up by turning the crank the magneto machine and bell are in circuit as long as the receiver hangs on a hook which forms a switch. The circuit is shown below. When the handle of the magneto is turned a current is sent out through the bell and hook to the line. Then the receiver is taken down and placed at the ear and the bell circuit is broken, merely the telephone circuit being in connection with the line wire. With a number of subscribers an exchange or central station is necessary where the wires connecting the various subscribers or other stations can be joined at will. At these stations an annunciator, which may be either a falling flap with the appropriate number or an incandescent lamp, informs the operator of the call and by means of the switchboard to which all the wires are led the connections desired by the subscriber are made. Improvements in switchboards and their increased size to meet the growing demands of cities have been most marked, and this form of apparatus is now so complex as to be quite unintelligible except to a telephone engineer, as almost every part of the apparatus has been subjected to important improvements.



TELEPHONE CIRCUIT WITH HOOK DOWN AND WITH HOOK UP.

a and *c* binding posts connecting with the line. The post *b* forms the ground connection for lightning. The dotted lines indicate that part of the circuit cut out by the hook switch.

The use of a common battery at the central station has been one of the most important developments of recent years, as it does away with the magneto call at the subscriber's instrument, a saving of no small dimensions, as the magneto machine was the most expensive part of the equipment, the mere removal of the receiver informing the central operator of the subscriber's presence at the telephone. In the Hayes system, which is extensively employed in the United States, a device known as a repeating coil is used, and the battery is bridged across the circuit at the central station. The repeating coil consists of a transformer or induction coil formed by two coils of wire of equal length and size, it being customary to wind the four coils required for two repeating coils on the same core. There are two sets of windings in each circuit and the current of the battery divides and passes through a single coil before reaching the line or main circuit wires. In other words, the negative pole of the battery connects with the two sets of windings of one repeating coil, one of which joins the wires leading to each station, while the positive pole is similarly connected on the other side. Any variation in the current caused by the action of the sound waves on the transmitter of one circuit will produce similar effects in the other circuit by inductive action. Such is the case when the line is arranged for talking. To signal the central station the subscriber removes his receiver from the hook, thus closing a circuit which acts upon a relay and causes a small incandescent lamp to glow. This gives the signal to the central operator, who immediately completes the talking circuit first with her own transmitter and receiver, and then with that of the desired subscriber. The attention of the latter has been attracted by a call bell energized by an alternating current. This bell is in series with a condenser which has been bridged across the main circuit. Another central energy system is that of Stone, where impedance coils, or wire windings of considerable self-induction, are placed in the circuit instead of the repeating coils of the Hayes system. The effect of these coils is to prevent the rapidly alternating current in the telephone circuit flowing through the battery and to have it travel along the line to the other station where the impulses are reproduced. In the Dean-Carty System an impedance coil is employed bridged across the main circuit at the plugs and to the centre of it is connected one pole of a battery whose other terminal is grounded. There is also an impedance coil at each station connected with both sides of the circuit and its centre point is connected with the transmitter and the primary of the induction coil which are connected with the ground. All of the various systems for central energy in actual practice are necessarily exceedingly complex and are subject to important modification and improvement, but the foregoing are the more important. There are also methods where storage cells are used at the subscriber's station and where a thermopile is employed in connection with an ordinary lighting circuit.

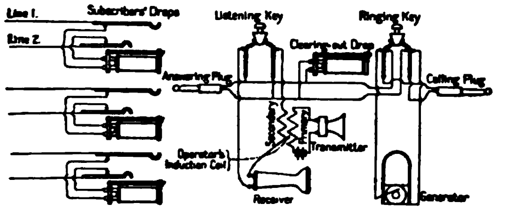


DIAGRAM OF SIMPLE METALLIC CIRCUIT SWITCHBOARD.

When a call is received the current coming in on the line wires causes the drop to fall, thus announcing the number of the subscriber. The central operator then inserts the answering plug in the jack, and, pressing the listening key, puts her instrument in circuit. She then inserts the calling plug in the jack belonging to the line of the desired subscriber, and by pressing the ringing key sends a signal to the latter's instrument.

Long-distance telephony was first made possible in 1885, when the American Bell Telephone Company organized the American Telephone and Telegraph Company. For several years previously experimental lines with metallic circuits of hard drawn copper were operated between New York and Boston. In 1885 a regular line between New York and Philadelphia was constructed, and so great was its success that within two years long-distance lines were established between New York and Boston, Albany and Buffalo, Chicago and Milwaukee, Boston and Providence, and New York and New Haven. The New York and Chicago circuit, 950 miles distance, 1900 miles of wire, was opened October 18, 1892, and long-distance telephoning between New York and Milwaukee and Saint Louis is also carried on. The American Bell Telephone Company in 1900 acquired the rights of patents of M. I. Pupin, by which the limits of long-distance telephony are greatly increased and conversation over circuits where there are submarine conductors of considerable length is possible. This is accomplished by inserting coils of self-induction at regularly recurring intervals along the line obtained by calculation.

The American Bell Telephone Company practically controls the telephone business of the United States, though a number of strong independent companies have been organized, whose business is increasing.

STATISTICS OF THE AMERICAN BELL TELEPHONE COMPANY FROM 1894 (JANUARY 1ST) TO 1901

	1894	1895	1896	1897	1898	1899	1900	1901
Exchanges	838	867	927	967	1,025	1,126	1,239	1,348
Branch offices	571	572	686	832	937	1,008	1,187	1,427
Miles of wire on poles	214,676	232,008	260,324	286,632	327,315	396,503	509,036	627,897
Miles of wire on buildings	16.492	14,525	12,861	12,594	13,776	15,329	15,067	16,833
Miles of wire underground	120,675	148,285	184,515	234,801	282,634	358,184	489,250	705,269
Miles of wire submarine	1,637	1,856	2,028	2,818	2,675	2,973	3,404	4,203
Total miles of exchange service wire	353,480	396.674	459,728	536,845	626,400	772,969	1,016,777	1,354,202
Total circuits	205,891	212,074	237,837	264,645	295,904	338,293	422,620	508,262
Total employees	10,321	11,094	11,980	12,425	16,682	19,668	25,741	32,837
Total subscribers	237,186	243,432	281,695	325,244	384,230	415,180	432,946	800,880

PUBLIC OWNERSHIP OF TELEPHONES. In Europe public ownership of telephones exists to a certain extent and there has been agitation in this direction in the United States. For the most part, such public ownership of telephones is national, rather than municipal, and is chiefly confined to countries where private ownership of franchises is far less common than public ownership. Actual statistics are not readily available, and are constantly changing, but an admirable summary of the ownership of telephones in various countries, made by U. N. Bethell, general manager of the New York and New Jersey Telephone Company (see Bibliography below), is as follows:

"All over Europe, with a few exceptions, the industry at present [early in 1903] is controlled and owned by States or municipalities. In Belgium, France, Switzerland, Germany, Austria, and Hungary the central Government operates the industry. In Holland the State operates the trunk lines; in the two principal cities, Amsterdam and Rotterdam, the municipalities operate the local systems; and at The Hague a private company operates. In Denmark and Norway private enterprise under Government control operates the industry, while in Sweden the State operates it, except that in Stockholm and vicinity a private company since 1890 has been in active competition with the State. In Great Britain, in most places, private enterprise operates the local systems under license from the State; in a few places municipalities operate or are preparing to operate local systems; the State operates the trunk lines. In the United States private enterprise, under Government control, operates both the local systems and the trunk lines."

Among the municipal telephone systems in use or under construction in Great Britain early in 1893 were those at Glasgow, Portsmouth, Swansea, Brighton, and Hull. The general movement for municipal telephones in Great Britain followed a Parliamentary act of 1899, authorizing municipal construction. Tunbridge Wells and Glasgow, in 1901, were the first to install and operate systems under the act, but after an active campaign against public ownership in Tunbridge Wells the municipal plant was sold to its private competitor, in the latter part of 1902. There were conflicting reports as to the financial success of the plant, but apparently the advice of the engineer was not followed during construction, while subsequently the plant suffered from poor management. It is said that the municipal plant resulted in a marked reduction of rates and that when sold it yielded a profit. It should be added that in 1911 all telephone licenses granted to private companies in Great Britain will expire, and that all such companies pay 10 per cent. of their gross receipts to the Post-Office Department, which has had a monopoly of the telegraph business since 1869. The policy of the Post-Office Department is to monopolize the telephone as well.

The general question of municipal ownership has been discussed at length under that head. The public interests demand that the business shall be conducted as a monopoly, under public control. The latter does not exist in the United States to the extent that might be inferred from the closing sentence of the above quotation, but that is largely the fault of the legislative and executive departments of the several States, and to some extent of the municipalities also. Finally, the long-distance lines would be a troublesome factor in municipal ownership in America, unless they, as in some countries abroad, were owned by the general Government.

BIBLIOGRAPHY. The following list contains some of the more important works on the telephone to which the reader is referred for further information: Miller, *American Telephone Practice* (New York, 1899); Alsopp, *Telephones, Their Construction and Fitting* (London, 1900); Houston and Kenelly, *The Electric Telephone* (New York, 1896); Webb, *Telephone Hand-book* (Chicago, 1894; new ed. 1901); Hopkins, *Telephone Lines and Their Properties* (New York, 1898); Prescott, *Bell's Electric Speaking Telephone* (New York, 1884; 2d ed. 1890); Thompson, *Philipp Reis, Inventor of the Telephone* (London, 1883). For discussion of the public ownership of telephones consult some of the references under MUNICIPAL OWNERSHIP; also papers by Bethell (against), Parsons (for) and Bennett (as to Great Britain) in "Proceedings of National Convention upon Municipal Operation and Public Franchises," published in *Municipal Affairs* (New York, vol. vi., No. 4, 1902-3); also Hemenway on "Municipal Telephones," *Proceedings Seventh Annual Convention League of American Municipalities* (Des Moines, Iowa, November, 1903).

TEL'EPHUS (Lat., from Gk. Τήλεφος). In Greek legend, a king of Teuthrania, in Southern Mysia. Auge, the daughter of King Aleos of Tegea, was loved by Hercules and bore him a son, Telephus. In anger her father inclosed mother and child in a chest and cast them into the sea. The chest floated across the Ægean to the mouth of the Caëus, where Teuthras married Auge and brought up Telephus, who succeeded him on the throne. This early version was modified by the tragedians. Auge became priestess of Athena, and the child was born, or at any rate exposed, on Mount Parthenion, where it was suckled by a doe, and (in one version) found by Hercules. Auge meanwhile was cast into the sea and brought to Mysia, where she was adopted by Teuthras. Later, Telephus came to Mysia on account of an oracle, helped Teuthras against powerful enemies, and was rewarded by the hand of Auge. On the marriage night mother and son recognized each other. When the Greeks were on their way to Troy, they landed by mistake in the territory of Telephus and harried the country. Telephus defeated the invaders, but was himself wounded by Achilles. As an oracle informed him that only he who had wounded him could cure, he went to Greece, and as the Greeks needed his guidance to reach Troy, they yielded and Achilles healed the wound with rust from his spear. Telephus then guided the Greeks to Troy, but refused to take part in the war, since his wife, Astyoche, was a daughter (or sister) of Priam. The whole story of Telephus was represented on the smaller frieze of the Great Altar of Pergamon, and his battle with Achilles in the west pediment of the Temple of Athena Alea at Tegea. Consult: Pilling, *Quomodo Telephi fabulam et scriptores et artifices veteres tractaverint* (Halle, 1886); Jahn, *Telephus und Troïlos* (Kiel, 1841); id., *Telephus und Troïlos und sein Ende* (ib., 1859).

TELESCOPE (from Gk. *τηλεσκόπος*, *têleskopos*, far-seeing, from *τῆλε*, *têle*, afar + *σκοπεῖν*, *skopein*, to look). Essentially a lens or mirror to form an image of a distant object and a miscroscope to enable the observer to examine this image in detail. The invention of the telescope was doubtless accomplished in Holland, but there is no little confusion and controversy to be encountered in attempting to determine the original inventor. Tradition has it that about the beginning of the seventeenth century one Jansen, a spectacle-maker of Middleburg, Holland, constructed a telescope about 16 inches in length which he exhibited to Prince Maurice and the Archduke Albert, who, appreciating the importance of the discovery, paid him a sum of money to keep it concealed. Another spectacle-maker, Lippershey, made application (1608) to the States General for a patent for a telescope, as also did Metius, a professor of mathematics, but in the former instance, at least, it was refused, as the apparatus was already known. It seems certain that the instrument was known more or less about Europe, but the honor of its invention is usually given to Galileo, who was the first to describe the instrument and exhibit it in a complete form (May, 1609). Galileo having heard that a device to magnify distant objects had been constructed in France or Holland, immediately set to work to produce such an instrument. His telescope, similar in form to the modern opera glass (q.v.) and composed of a convex object glass and a concave eyepiece, as first constructed had a magnifying power of 3 times, but this was subsequently increased to 30 times, and Galileo was able to discover the satellites of Jupiter, the mountains of the moon, and other celestial objects. To Kepler we owe the discovery of the principle of the astronomical telescope with two convex lenses, and the description of such an instrument is contained in his *Catoptrics* (1611). This idea was actually employed in a telescope constructed by Father Scheiner (*Rosa Ursina*, 1630), and such telescopes were used in increasing numbers until the middle of the seventeenth century, when they were practically universal, and improved construction made possible Huygens's discovery of Titan, the brightest satellite of Saturn.

In order to appreciate the development of the telescope it may be worth while to consider some of the fundamental principles on which its action is based. A convex lens will give an image of a distant object which can be received on a screen, as in the camera obscura (q.v.). If instead of the screen we use a simple microscope or lens to observe this image which is formed in the air, we have an astronomical telescope. This will appear from the accompanying diagram.

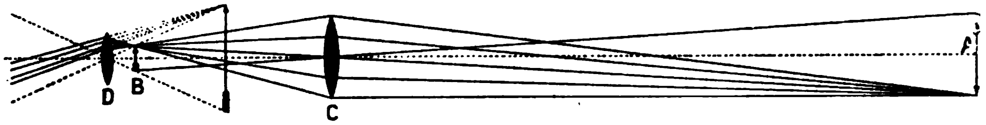


DIAGRAM OF ASTRONOMICAL TELESCOPE.

C represents a convex lens, the object glass of a telescope; A is a distant object and B is a real and inverted image formed by the lens. The size of this image depends upon the ratio of the two conjugate foci or distances from the lens to the image and the object. As the distance of the lens from the object is necessarily fixed, depending of course on the positions of the object and the observer, in order to obtain as large an image as possible, it is necessary to increase the focal length of the lens. From the discussion of lenses in the article on LIGHT (q.v.) it will appear that in order to obtain a large focal length for a telescope an object glass with large radii of curvature is essential. This, however, is not feasible in actual practice, as was found by the early astronomers after experiences with telescopes having focal lengths as great as 600 feet; and lenses of shorter focal length but of improved construction were adopted. The next question involved is the size of the object glass, or, as it is technically expressed, its aperture. The larger the lens the greater will be the amount of light transmitted. The pupil of the eye through which the light producing an image passes normally is about 1·5 of an inch in diameter, consequently as much more light will pass through the telescope as the square of the diameter of the object glass is times greater than the square of the diameter of the pupil. But if the image formed is too large, then the light will be distributed and the image will lack brilliancy and not be plainly visible. Taking these facts into consideration, it would appear that the greater the focal length of the lens and the greater its surface, the more satisfactory would be the image produced. This would be the case were it not for the fact that both spherical and chromatic aberration (q.v.) increase with the aperture of a lens, and that the larger the piece of glass, the greater the difficulty of securing homogeneity and freedom from imperfections. Increasing the focal length increases the difficulties involved in mounting the telescope as well as in the manufacture of the objective itself. To observe the image formed by the objective an eyepiece is used, whose action is simply to magnify the image.

The image furnished by the object glass is inverted and is merely magnified by the eyepiece. In what is known as the terrestrial telescope there is an additional lense or lenses added to erect or invert the image so that it will appear to the eye in its natural position. This lens merely forms a new image which is then viewed by the eyepiece as in the case of the astronomical telescope, the action being shown in the accompanying diagram, the erecting lens and the eyepiece being in reality a compound microscope to view the image furnished by the objective.

In the diagram C is the object glass, B is the inverted image formed by the rays coming from a distant object in the direction A, E and G serve merely to invert the image B and form it anew and erect at H where it is observed by the eyepiece D.

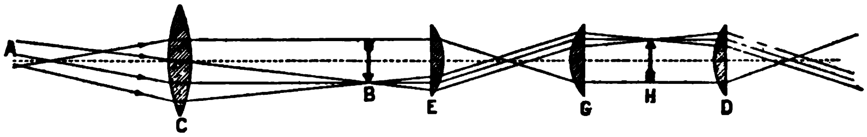


DIAGRAM SHOWING TERRESTRIAL TELESCOPE.

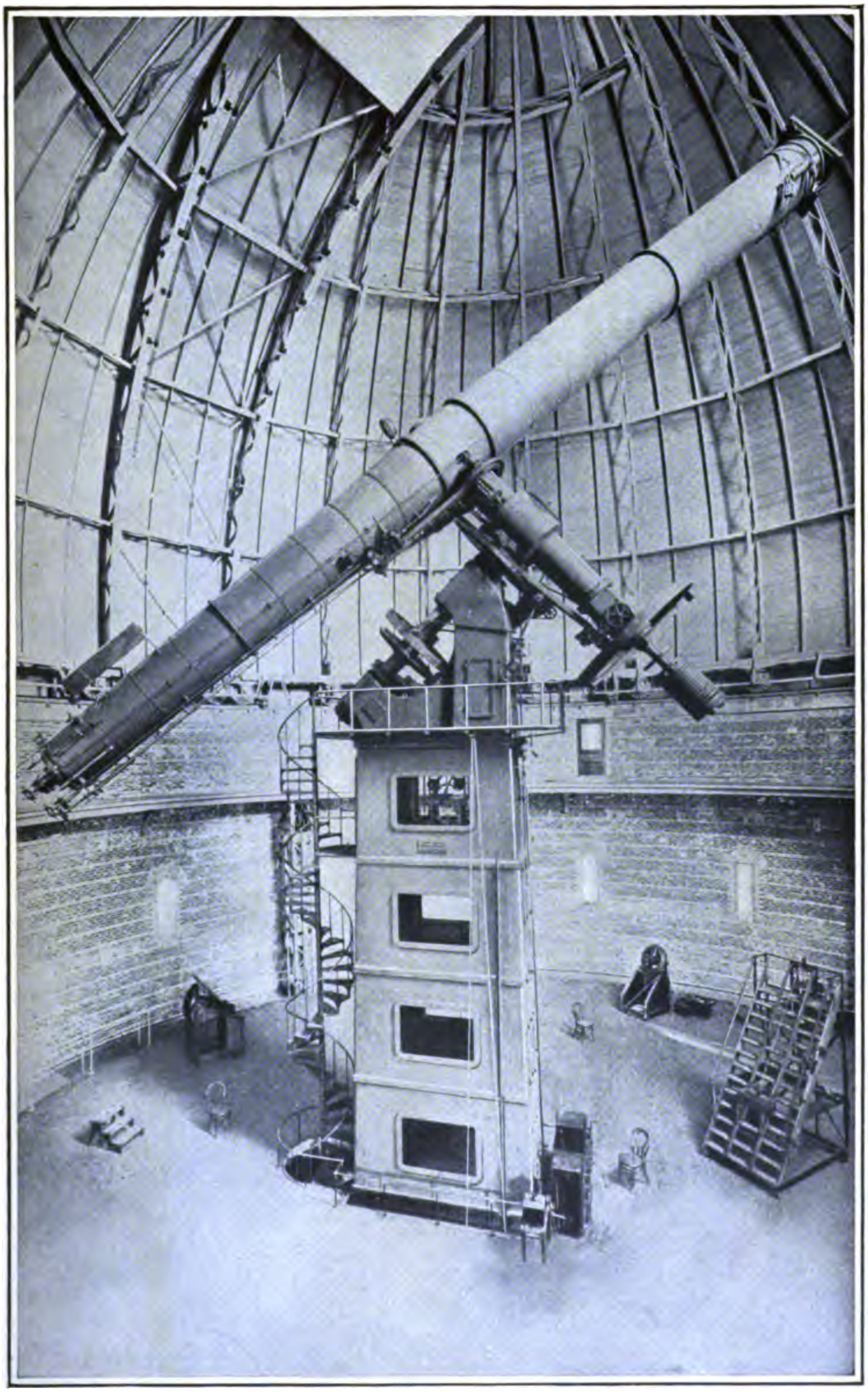
Other arrangements of the terrestrial eyepiece could be mentioned, but the one described is one of the earliest and simplest.

While the greatest care must be expended on calculating and constructing the object glass, the eyepiece is by no means unimportant. As the magnifying power of the telescope (the ratio of the angles formed by lines drawn to the extremities of the image and the object) is equal to the quotient obtained by dividing the focal length of the objective by that of the ocular, it would be of advantage to use a lens of comparatively large curvature, but here again chromatic and spherical aberration must be considered, for sharpness and distinctness are as essential as high magnification. In practice eyepieces vary considerably, depending on the use to which they are to be put. Generally they consist of two achromatic lenses, one convex, known as the field lens, which brings together the outer rays of the beam, while the lens nearest to the eye may be either positive (convex) or negative (concave). In case a micrometer is used to measure the image a positive lens is employed and the combination, which is known as a Ramsden eyepiece, though not quite achromatic, has a flat field. For mere observation the Huygenian eyepiece, with a negative lens of one-third of the focal length of the field lens, is preferable. The addition of lenses to the eyepiece acts to cut off the supply of light and to destroy the brightness of the image. Accordingly in the terrestrial telescope, while we have the erecting lens which inverts the image to its proper position, yet the image is not as bright as in the case of the opera glass, where there is far less magnifying power.

The difficulties due to spherical aberration were early experienced by opticians and astronomers, and in an attempt to obviate them astronomical telescopes were constructed of considerable focal length and power. From observations made with such instruments by Huygens, who was the pioneer in this line, he was able to present the first explanation of Saturn's rings (1659). He constructed a telescope 300 feet in length which magnified 600 times, while the telescope used by Cassini to discover the fifth satellite of Saturn (Rhea) was built by Campani of Rome and magnified about 150 times. The diameter of Venus was determined in 1722 by Bradley with a telescope of 212 feet focal length. These telescopes of extreme length were known as aërial telescopes, and naturally their mounting and manipulation presented many difficulties. In spite of these awkward conditions, valuable observations were made and ingenious appliances introduced to facilitate the operations. The invention of the achromatic object glass by Dollond in 1757-58 and the improvement of optical flint glass, which commenced in 1754, soon made possible the construction of improved telescopes, but these were all of modest dimensions, and until well into the nineteenth century few if any object glasses were constructed greater than twelve inches in diameter. The discovery of methods of making large disks of flint glass was made by Guinand, a Swiss mechanic, who then became associated with Fraunhofer (q.v.), and telescopes as large as 10 inches aperture were readily made. His successors made instruments with object glasses 15 inches across. The next successful manufacturer of telescope lenses was Alvan Clark of Cambridgeport, Mass., who from the time when an object glass manufactured in his shop was purchased by the Rev. W. R. Dawes of England, gradually achieved the highest rank as a maker of telescope lenses. At the Cambridgeport works have been constructed the lenses not only for the leading American observatories, but also for the Imperial Russian Observatory at Pulkova, and other European institutions. The manufacture of telescope lenses is to be regarded as a fine art, and the ability to work the disks of glass with the requisite precision and delicacy is possessed by but few.

The formation of an image by a concave mirror has been made use of in the reflecting telescope, of which numerous varieties have been devised and with which many of the most important astronomical discoveries have been made. The principle of this instrument will be apparent from the following diagram and explanation:

TELESCOPE



THE FORTY-INCH YERKES TELESCOPE OF THE UNIVERSITY OF CHICAGO.

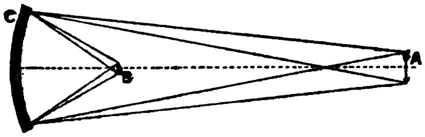
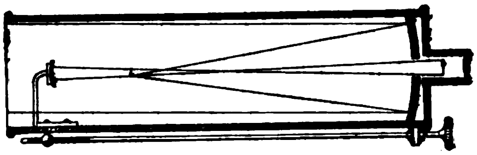


DIAGRAM SHOWING FORMATION OF AN IMAGE BY A CONCAVE MIRROR.

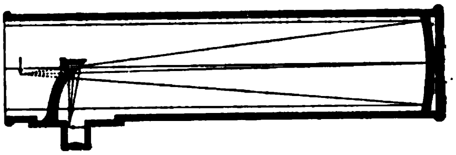
C is a concave mirror on which rays from a point of a distant object, A, fall. Following the law of reflection, these rays will be reflected and will be united at B, the focus for rays from the given point. The object A is made up of a number of such points; consequently at B there will be a number of points where the rays from A are collected and an image of the original object will be formed. If the rays come from an object infinitely distant, or in other words are parallel, they will converge at the principal focus, which is one-half of the radius of curvature. This will be the case in a mirror of large radius and for rays that are incident, not far from the axis; but if the mirror is large, then the rays near its circumference will not be brought to a focus at the point B, but nearer to the mirror, and consequently a blurred image will be produced. This is known as spherical aberration and is discussed under that head. Theoretically this could be remedied by the construction of a mirror of parabolic section, as the configuration of such a mirror is such that all parallel rays are brought to a focus in the same point. In practice, however, this is extremely difficult of attainment, as to secure a properly shaped mirror the most minute amounts of material must be removed from a spherical surface in order to make it parabolic. When an image is formed in this way it can be viewed either by being received on a screen or it can be observed with an eyepiece or a simple microscope. This is done in several ways in the reflecting telescope, and the chief points of difference in the various instruments are mainly in this respect. A concave mirror, according to tradition, was used by Ptolemy Euergetes on a lighthouse at Alexandria to discover distant ships. The Romans were acquainted with the power of collecting or concentrating rays of light possessed by such a mirror, but there does not seem to be any well-authenticated record of the application of the idea to the purposes of a telescope.

Father Zucchi, an Italian Jesuit, was the first to use an eye lens to view the image produced by a concave mirror (1616-1652), but to Gregory is due the first description of a telescope with a reflecting mirror, and the instrument has since been known by his name. Gregory, along with others, realized the shortcomings of a telescope with lenses and believed that the manufacture of concave mirrors would be attended with far less difficulty. An actual working instrument based on this principle was devised and constructed by Isaac Newton. With a telescope formed by a mirror of 6½ inches focal length, which magnified 38 times, he was enabled to make important observations. In these telescopes the great difficulty was viewing the image, as the eyepiece and the head of the observer would cut off a large portion of the incident rays. In the Gregorian telescope this was obviated by the interposition of a second concave mirror, which reflected the rays to the eyepiece, as is shown in the following diagram:



GREGORIAN TELESCOPE.

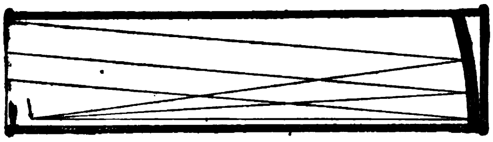
Newton used a plane mirror placed at an angle of 45° to the axis, which reflected the rays into an eyepiece arranged as in the following diagram:



NEWTONIAN TELESCOPE.

Draper used a total reflection prism instead of the plane mirror with considerable success, being one of the few astronomers in the United States to construct a reflecting mirror. Cassegrain employed a convex mirror instead of a concave one.

Herschel obtained satisfactory results by tilting his mirror and placing the eyepiece below the axis of the instrument, so that it was not in the way of the incident rays. Herschel's mirrors were as large as four feet in diameter, with a tube forty feet in length.



HERSCHEL'S TELESCOPE.

The reflecting telescope was extensively used because there was no chromatic aberration caused by refraction. Spherical aberration was, however, present and was a serious drawback. According to geometrical calculations, as has been said, there would be no spherical aberration if a parabolic mirror was used, as all the rays from a distant object would come to a focus at one point. The grinding of a parabolic mirror, however, was attended by many difficulties and was practically impossible except to a few opticians.

Perhaps the most celebrated reflecting telescope was that of Lord Rosse, whose mirror was six feet across. This was completed in 1842 and erected at Parsontown in Ireland. While famous for its size, this telescope has never been used in making discoveries of prime importance, and has not been used during recent years, being so mounted as not to be available for photographic work. Second to this, as will be seen from the table at the end of this article, is the reflector of Dr. A. A. Common at Ealing, England. Using the largest glass disk that could be obtained, five feet in diameter, Dr. Common produced a perfect mirror, which is mounted equatorially. This telescope is of the Newtonian type and has been particularly useful in celestial photography. The mirrors for reflecting telescopes were usually made of speculum metal, which is composed of a mixture of copper and tin, until Liebig discovered the method of depositing a film of silver on a glass surface.

The use of silvered glass for mirrors was suggested by Steinheil and later by Foucault, and has met with general adoption, as it not only facilitates the construction of the mirror, but makes possible its resilvering at any time without the destruction of its configuration. The reflecting telescope is available for photographic or spectroscopic work, as well as for visual observation, but the chief defects are the difficulty of grinding the metal or glass to true parabolic shape and the deformation of the mirror in its mounting owing to its great mass. In recent years the most important use made of a reflecting telescope has been to photograph the Nebulæ with the Crossley reflector of the Lick Observatory (q.v.), which is the largest telescope of this description in the United States. It was made by Dr. A. A. Common and was presented to Lick Observatory by Edward Crossley. Professor James T. Keeler, the director, remounted this instrument and in 1899 made a remarkable series of photographs.

The mounting of telescopes has also kept pace with the improvement of lenses and mirrors. Newton used a ball and socket joint to mount his small reflector, and then various arrangements of framework were employed for the aërial telescopes and later for the large reflectors. The first equatorial (q.v.) mounting is ascribed to Lassel. In England telescopes were mounted by having the polar axis supported at each end, but the German system, where the mounting is in the centre and the weight of the telescope is balanced by counterpoises, is now generally used for large refractors. The modern telescope is not merely an instrument for visual observation, but in connection with photography and the use of the spectroscope its field has been widely increased. Fraunhofer, who first used the spectroscope instead of the visual eyepiece, was able to record the spectra of Venus and Sirius, and since that time the combination of telescope and spectroscope has made possible some of the most important advances in astronomy. One of the earliest applications of photography was to the heavens, and the object glass of the telescope was used with the eyepiece removed, the image being formed directly on the plate. In the early stages of this work both reflecting and refracting telescopes were used, but with the latter it was found that special lenses were necessary in which the correction for chromatic aberration was arranged with regard for the actinic rather than the visual rays. The green, yellow, and red rays, which affect the human eye the most, do not produce the chemical effects on the photographic plate, which must be placed at the focus of the violet rays, and consequently a photographic objective is constructed so as to bring the blue and violet rays to a single focus. One of the first telescopes constructed for this purpose was by Lewis M. Rutherfurd (q.v.), with which many fine pictures of the moon were made. At the Lick Observatory photographic work with the large telescope has been accomplished most successfully by using an extra lens at the objective, which brings the photographic rays to a focus instead of the visual rays. At the Yerkes Observatory of the University of Chicago this difficulty has been overcome by the use of color screens, and photographs made in 1900 indicate the general usefulness of the method. The color screen is mounted in the plate-holder and is of a greenish yellow tint, which cuts off the blue rays. Orthochromatic plates are used and are affected by the rays in the middle part of the spectrum. So important is the photographic use of the telescope that in 1900 there were 18 photographic telescopes in various parts of the world engaged in making photographs for an International Star Chart to cover the entire heavens.

Of the modern telescopes of interest the instrument known as the *equatorial coudé* of the Paris Observatory is worthy of mention. In this instrument the observer is comfortably situated in an ordinary building, while mirrors are so arranged as to reflect the light into the telescope and then to the eyepiece. The tube of the telescope is in the form of an elbow, whence its name, with one arm forming the polar axis. At the point of intersection of the two arms there is placed a plane mirror, while in front of the object glass is a second plane mirror which is movable and enables light from any portion of the sky to be reflected into the tube. Very successful photographs of the moon have been made with this instrument, which has both visual and photographic object glasses 23½ inches in diameter. The great telescope of the Yerkes Observatory of the University of Chicago at Williams Bay, Lake Geneva, Wisconsin, is the largest telescope with an equatorial mounting, and until the construction of the Paris Exposition telescope was the largest refractor in existence. This instrument was mounted in a special observatory (for illustration, see OBSERVATORY) and both lenses and mounting represented the best work of modern opticians and mechanicians. The objective, which is 40 inches in diameter and has a focal length of nearly 62 feet, weighs when mounted in its cell about 1000 pounds. The crown-glass lens, which is 2½ inches thick at the centre and 3¼ inches at the circumference, weighs 200 pounds, and is separated from the flint-glass concave lens by 8⅝ inches. The latter weighs over 300 pounds and is about 1½ inches thick at the centre and 2 inches thick at the edges. The lenses are mounted upon aluminum bearings in a cast-iron cell. The telescope itself is mounted on a cast-iron column of four sections bolted together and resting on a cast-iron foot, which in turn rests on a concrete foundation. The clock room is located in the upper part of the cast-iron column and contains the mechanism for driving the telescope. The instrument is in perfect balance, a mechanical feat of no little difficulty when it is remembered that there is a weight of 1000 pounds at the object-glass end. The observatory is provided with a rising floor for the convenience of the observer, who is thus able to use the telescope in comfort, irrespective of its elevation. The most recent as well as the largest telescope is that built for the Paris Exposition of 1900 by M. Gautier, which differs materially from the large telescopes previously constructed. The object glasses of this great instrument are 49 inches in diameter and the tube 197 feet in length. Instead of being mounted equatorially, as are the large telescopes at the Lick and Yerkes Observatories, the Exposition telescope is fixed in a horizontal position, its axis being due north and south. Light is reflected into the tube by a siderostat on which the direct rays from the heavens fall. The siderostat, which was invented by Foucault, is a movable mirror with a plane surface mounted on such a mechanism that the light falling on the mirror from a given portion of the heavens will always be reflected to the object glass of the telescope. In other words, instead of the telescope being moved about its polar axis, as would happen with an equatorial, the mirror is given such a motion that it neutralizes the movement of the earth. This idea is said to have been suggested by Robert Hooke at a time when the long-focus lenses of Huygens were being used and the difficulties attending their mounting were under consideration. On the occasion of the transit of Venus in 1882 Lord Lindsay employed a heliostat in connection with his 40-foot telescope, while for taking photographs the American observers used the same method most successfully. When it was proposed to erect at the Paris Exposition a telescope larger than any previously attempted, it was realized that an equatorial of greater size than those of the great observatories in the United States was practically impossible, and accordingly the fixed form was adopted. Both visual and photographic objectives are provided, and with the latter the largest photographs of the moon yet produced have been taken. Each lens weighs half a ton and they were constructed by M. Gautier, who also made those for the University of Chicago telescope. Although in this form of telescope there is no elaborate mounting with mechanical devices, yet as much care must be expended on the siderostat as on the object glasses. The mirror forming the essential part of this instrument is 78½ inches in diameter, is 11 inches in thickness, and weighs 3600 kilograms (nearly 8000 pounds).

It is believed by astronomers that for direct visual observations the refractor is the better instrument, while for the study of stellar, planetary, and nebular spectra and the photography of these bodies the reflector is the more useful. Also the latter instrument can be used to advantage in photometric and radiometric investigations of the moon and the planets. The reflector is free from chromatic aberration, and there is not the absorption of light which occurs when lenses of large apertures are employed. Larger angular and linear apertures can be used and the mounting is far more simple than for a refractor of corresponding size. The development of the fixed refracting telescope is at present being awaited by astronomers, as it will obviate many difficulties of construction, mounting, and expense.

LIST OF LARGE TELESCOPES IN EXISTENCE IN 1900

REFRACTORS 15 INCHES AND UPWARD

	Inches
Paris (Exhibition)	50
Yerkes	40
Lick	36
Pulkova (Russia)	30
Nice	29.9
Paris	28.9
Greenwich	28
McCormick Observatory, Virginia	26
Washington, United States	26
Newall's, Cambridge, England	25
Cape of Good Hope	24
Harvard	24
Princeton, N. J	23
Mount Etna	21.8
Strassburg	19.1
Milan	19.1
Dearborn, Chicago	18.5
Warner Observatory, Rochester, United States	16
Washburn Observatory, Madison, Wis	15.5
Edinburgh	15.1
Brussels	15.1
Madrid	15
Rio de Janeiro	15
Paris	15
Sir William Huggins	15

REFLECTORS 2 FEET 6 INCHES AND UPWARD

	ft.	ins.
Lord Rosse	6	
Dr. Common	5	
Melbourne	4	
Paris	4	
Meudon	3	3
South Kensington	3	
Crossley (Lick Observatory)	3	
Greenwich	2	6
South Kensington	2	6

BIBLIOGRAPHY. Drude, *Theory of Optics* (London, 1902); Chauvenet, *Spherical and Practical Astronomy*, vol. ii. (Philadelphia, 1863); for history and theory, consult Lockyer, *Stargazing, Past and Present* (London, 1878). For more recent developments consult various articles in the *Astrophysical Journal*, especially by the following: Wadsworth, 1897 and 1902; Reese, 1902; Ritchey, 1901.

TEL'ESIL'LA OF AR'GOS (Lat., from Gk. Τελέσιλλα) (c.510 B.C.). A Greek poet. She was born at Argos and is said to have served in the Argive army against Sparta. Even if these deeds are mythical, her name became a symbol for patriotic enthusiasm and her statue was placed in the Temple of Aphrodite. Her lyrics are lost except for two lines found in Bergk's *Poetæ Lyrici Græci* (vol. iii., 4th edition).

TELETS LAKE. A lake of Siberia. See ALTIN.

TEL'FORD, THOMAS (1757-1834). An eminent Scottish engineer, born in Eskdale, Dumfriesshire. At the age of fourteen he adopted the trade of a stone-mason. In 1780 he removed to Edinburgh, and in 1783 he repaired to London, where he was appointed in 1784 to superintend the erection of the resident commissioner's house at Portsmouth dockyard. In 1787 he was appointed surveyor of public works for Shropshire; and his two bridges over the Severn at Montford and Buildwas and other works gained for him the planning and superintendence of the projected Ellesmere Canal, to connect the navigation of the Severn, Dee, and Mersey—a work which occupied ten years (1795-1805). In 1801 he received a commission from the Government to report on the state of Scotland, and on the desirable public works for that country. As a consequence, the plan of a canal from Inverness to Fort William was revived, and its planning and construction intrusted to Telford. (See CALEDONIAN CANAL.) In the same capacity he constructed more than 1000 miles of road in the Highlands, Lanarkshire, and Dumfriesshire and about 1200 bridges, besides churches, manses, harbors, etc. In 1808, and again in 1813, he was invited to Sweden, to report on the projected scheme for connecting Lake Vener with the Baltic, and superintended the construction of the Göta Canal, by which this was effected. His next great work was the construction of the road from London to Holyhead, including the erection of numerous bridges—among others, of the Menai suspension bridge. For the last few years of his life he retired from the active duties of his profession, employed himself in collecting and arranging materials for a complete history of his various works, and had the greater portion of the MSS.

ready when he died suddenly at Abingdon street, Westminster. His life, entitled *The Life of Thomas Telford, Civil Engineer, written by himself*, was published in 1838. In America Telford is now chiefly known as a famous road-builder, and particularly for introducing the system of road improvement that bears his name. See ROAD.

TELL, WILLIAM. The hero of a Swiss legend, which in its main features is common to all Aryan peoples. It is found in the Icelandic Thidreksaga, in Saxo Grammaticus, in old English ballads, in Persian poetry, and elsewhere. These all tell of a master marksman and of a tyrant who compels him to pit faith in his skill against his natural instinct as a father. The Swiss legend, narrated with much circumstance, is that a mythical Austrian bailiff, Gessler, demanded homage to the cap of Austria in the market place at Altorf. Tell refused this homage, was condemned to death, but permitted to ransom himself by shooting an apple from the head of his son. On signifying his intent to have killed Gessler if he had killed his son Tell was fettered and carried to the bailiff's boat. A storm arose and Tell was released that he might save the boat. This he did, then leaped ashore, and killed Gessler. The story then speaks of a revolt in which Tell takes part and by which the Forest Cantons gain independence. The date is 1307. The oldest chroniclers know nothing of the tale. It appears timidly, late in the fifteenth century, in *Das weisse Buch*, and more boldly in Tschudi's *Chronicon* (c.1550). The numerous Tell monuments are all relatively modern. The most famous version of the story is Schiller's drama *Wilhelm Tell* (1804). The Swiss had many folk-plays on the subject. Consult Rothe, *Die dramatischen Quellen des Schillerschen Tell*, in *Forschung zur deutschen Philologie* (1894); and for historical criticism of the saga, consult Rochholz, *Tell und Gessler* (Heilbronn, 1877).

TEL'LER, HENRY MOORE (1830—). An American politician and Cabinet officer, born at Granger, N. Y. He was educated at Alfred University, was admitted to the bar in 1856, and began practice at Binghamton, N. Y., but in 1858 removed to Illinois, and in 1861 to Colorado. He was a Republican member of the United States Senate from 1876 until April 17, 1882, when he entered the Cabinet of President Arthur as Secretary of the Interior. At the close of Arthur's administration, he again entered the Senate and was reëlected in 1891 as a Republican, but, being a strong advocate of free silver, left the Republican national convention in 1896 after it had adopted a gold standard plank and supported W. J. Bryan for the Presidency. In the same year he was returned to the Senate as an independent Silver Republican, and in 1903 was reelected as the regular Democratic nominee.

TELLEZ, tĕl′yāth, GABRIEL (c.1571-1648). A Spanish dramatist. It is probable that he early became a member of the Order of La Merced at Toledo. He was well known as a comic playwright before 1610, and had become the superior of a monastery of his Order at Trujillo by 1619. At his death he was prior of the monastery at Soria. The most important compositions of Tellez are the dramas which he produced under the pseudonym of Tirso de Molina. His best tales are contained in the collection entitled *Cigarrales de Toledo*. A second collection is the *Deleitar aprovechando* (1635), which in addition to some pious stories has a few religious dramas or *autos*. About eighty plays are known to be extant. The *Burlador de Sevilla*, the first work of great merit to bring Don Juan on the boards, has long been attributed to Tellez, yet some competent critics contest his authorship of it. Tellez was one of the best dramatists of the period of the greatest glory of the Spanish theatre; he is surpassed only by Lope and Calderon. Consult his *Teatro escogido*, ed. by Hartzenbusch (12 vols., 1839-42); his *Comedias escogidas*, also ed. by Hartzenbusch, in the *Biblioteca de autores españoles*, vol. v. (3d ed., 1885).

TEL'LICHER'RI, or **TEL'LICHER'RY**. A seaport in the District of Malabar, Madras, India, 90 miles south by east of Mangalore, on the Arabian Sea (Map: India, C 6). Population, in 1901, 27,883.

TELLURITE. A mineral tellurium dioxide crystallized in the orthorhombic system. It has a sub-adamantine lustre, and is of a yellowish-white or yellow color. It occurs as an incrustation with native tellurium in Transylvania and at various localities in Boulder County, Colo.

TELLURIUM (Neo-Lat., from Lat. *tellus*, earth). A non-metallic element discovered by Reichenstein in 1782. This element is found native in small quantities at various localities in Hungary, Transylvania, Virgina, and California. It is also found as tellurium dioxide or *tellurite*, as silver and gold telluride or *sylvanite*, as bismuth telluride or *tetradymite*, and in the form of other minerals, of more complex composition. It may be prepared by cautiously heating tetradymite with potassium carbonate and charcoal in a covered crucible, extracting the resulting potassium telluride (K_2Te) with water free from air, and then passing a current of air through the solution, the metal being thus deposited in the form of a powder.

Tellurium (symbol, Te; atomic weight, 127.49) is a white, shining, crystalline, brittle solid that has a specific gravity of 6.24, and melts at about 452° C. (about 846° F.). Like selenium, which it greatly resembles, it exists in amorphous and crystalline modifications, the conversion of the former into the latter being accompanied by the absorption of heat. There is also an increase of electric conductivity under the influence of light, though not so marked an increase as in the case of selenium. Tellurium combines with oxygen to form a monoxide (TeO), a dioxide (TeO_2), and a trioxide (TeO_3), the last two of which combine with water to form tellurous and telluric acids (H_2TeO_3 and H_2TeO_4 respectively), which in turn yield series of salts called respectively *tellurites* and *tellurates*. See PERIODIC LAW.

TEL'LUS (Lat., earth), more commonly TELLUS MATER. The Roman goddess of the field. She was invoked to protect and develop the seed. Her chief festival was the *Fordicidia*, celebrated on April 15th, when pregnant cows were sacrificed to her. On other occasions connected with seed-time and harvest she was worshiped jointly with Ceres. In later times the goddess is more commonly called *Terra Mater*. See also GÆA.

TEL'MANN, KONRAD. The pseudonym of the German poet and novelist Ernst Otto Konrad Zitelmann (q.v.).

TELPHERAGE (from *telpher*, from Gk. *τῆλε*, *têle*, afar + *φέρειν*, *pherein*, to bear). The automatic transportation of materials by electricity. Usually it is aerial transportation, and is employed for a car or truck operated by one or more electric motors which travels by means of grooved wheels on a tightly drawn wire cable. This truck receives its operating current by means of a short trolley pole and wheel from a wire conductor suspended over the track cable. The movement of the truck or telpher, as it is usually termed, may be controlled by an operator manipulating switches located at points along the line, or they may take place automatically. See CABLEWAYS for other methods of aerial transportation.

TEL'UGUS. The northeastern division of the Dravidian family, numbering more than 20,000,000 They present the typical aspect of the race—medium statured, mesocephalic to dolichocephalic in head-form. The Yanadis of Nellore, considered by some authorities to be the primitive Telugus, both with respect to physical characteristics and general culture status, are markedly dolichocephalic, broad-nosed, short-statured, and dark-skinned. The castes of the Telugus, adopted through Hindu influence, run down from the Brahmans to the despised Madigas, who are leather-workers. Other divisions are the Palayyakkarans and Tottlyans (cultivators), the latter of whom practice cousin-marriage; the Komatis (traders), who have their sacred book, the Kanyakapuran; the Boyas (hunters); the Bestas (hunters and fishers). Hinduism has largely, even among such primitive tribes as the Yanadis, superseded the old 'animistic' religion of the Telugus, though ancestor-worship and other relics of more ancient faiths appear here and there. About the middle of the sixth century some of the Telugus made their way into Ceylon, forming part of the advance-guard of the large Dravidian element in the island.

The Telugu language is second in importance of the Dravidian dialects, the first being Tamil (q.v.). In its linguistic structure Telugu coincides in the main with Tamil, although it differs widely from its older cognate in phonology and vocabulary. The alphabet is derived from one of the old forms of the Sanskrit devanagari script. (See DĔVÂNAGARĪ.) The vocabulary is strongly influenced by Sanskrit, from which about one-third of the literary Telugu words are borrowed. While Telugu is less primitive than Tamil, it far exceeds it in euphony, and is sometimes called the Italian of the East. The literature, which is outlined under the title DRAVIDIANS, is abundant and of much stylistic merit. Consult: Caldwell, *Comparative Grammar of the Dravidian, or South Indian Family of Languages* (2d ed., London, 1875); Arden, *Progressive Grammar of the Telugu Language* (Madras, 1873); Morris, *Simplified Grammar of Telugu* (London, 1890); Brown, *Telugu-English and English-Telugu Dictionary* (ib., 1852-54); Sankaranarayana, *English-Telugu and Telugu-English Dictionary* (ib., 1900); Carr, *Collection of Telugu Proverbs* (ib., 1868); Burnell, *Elements of South Indian Palæography* (2d ed., ib., 1878).

TEM'BULAND. A dependency of Cape Colony (q.v.), situated south of Griqualand East. Area, 4122 square miles. In 1891 it had a population of 180,415, including about 5200 Europeans.

TÉMÉRAIRE, tā'mā'râr', THE. A French battleship captured by the English in the battle of the Nile in 1798. In 1805 she took part in the battle of Trafalgar and was destroyed in 1838. The "Fighting *Téméraire*," a painting by Turner, exhibited in 1839, hangs in the National Gallery, London.

TEMESVÁR, tĕm'ĕsh-vär. A royal free city and capital of the County of Temes, Hungary, on the Béga Canal, 62 miles southeast of Szegedin (Map: Hungary, G 4). It consists of an outer and an interesting inner town or 'fortress.' There are a Catholic cathedral built by Marie Theresa, a Greek cathedral, immense barracks, and an arsenal (the castle built by Hunyady in 1442). The commander's palace, the Greek Catholic Bishop's palace, and a Gothic column (40 feet high), by Max, erected to the memory of the town's defenders of 1849, are among the noteworthy structures. There is a museum of art, natural history, and antiquities. The town has a royal tobacco factory and manufactures cloth, paper, and leather. Temesvár became a town in the thirteenth century. It was destroyed by the Tatars in 1242. From 1552 to 1716 it was held by the Turks, from whom it was taken by Prince Eugene. In 1849 it successfully resisted the attack of the Hungarian insurgents under Vecsey. On August 9, 1849, the Hungarians under Bem and Dembinski were defeated near Temesvár by the Austrians under Haynau. Population, in 1890, 43,483; in 1900, 53,033, mostly German Catholics.

TEMME, tĕm'me, JODOCUS DONATUS HUBERTUS (1798-1881). A German criminalist, politician, and novelist, born at Lette, Westphalia. He studied law at Münster and Göttingen, entered upon his judicial career in 1817 at Paderborn, and after holding various judicial offices became vice-president of the Provincial Court of Appeals at Münster in 1848. His attitude as a leader of the Extreme Left in the Prussian as well as the German National Assembly involved him in a trial for high treason, and, although he was aquitted by the jury, caused his dismissal from Government service, in 1851. In the following year he accepted the professorship of criminal law at Zurich. Whatever success attended his legal publications was outstripped by his reputation as the author of more than 150 novels and stories dealing with criminal plots, among which may be mentioned *Deutsche Kriminalnovellen* (1858-59), *Kriminalnovellen*, 10 vols. (1860-63), *Dunkle Wege* (1862), *Schwarzort* (1863), *Die Heimat* (1868), and *Die Generalin* (1877).

TEM'PE (Lat., from Gk. *Τέμπη*). A narrow mountain defile, about four and a half miles long, in the northeastern part of Thessaly, between the precipitous sides of Mount Olympus (q.v.) and Ossa (q.v.), through which flows the River Peneus. At places the rocky walls retire, leaving room for little glades and openings. Tempe was celebrated as one of the favorite haunts of Apollo. It was from the earliest times noted for its beauty and picturesqueness and was constantly praised in song. The name finally came to be applied to any beautiful and sequestered vale.

TEMPELTEY, tĕm'pel-tī, Eduard (1832—). A German dramatist, born in Berlin. He studied at the University of Berlin, and subsequently took up journalism. In 1862 he entered the service of the Duke of Coburg. Among his other duties was the superintendence of the Court theatre. He was the author of several popular dramas, among them *Clytemnestra* (1857) and *Cromwell* (1883).

TEMPERA (It., from Lat. *temperare,* to proportion, modify), or Distemper. In its original sense tempera signifies any fluid medium with which pigments may be mixed; but the term is usually restricted to a glutinous medium, such as egg, size, or gums, as distinguished from oil; and especially to that in which the yolk of eggs is the chief ingredient. In Italy the egg was diluted with the milky juice of young sprouts of the fig tree; in Germany and the North with vinegar and honey. Tempera differs from fresco in that the pigments are not applied to the fresh plaster, but to the dry surface; they may be applied to any kind of surface. When tempera paintings have been coated with an oil varnish for purposes of preservation, it is difficult to distinguish them from oils. They are usually clear and brilliant in color, precise in form and outline; the rapid drying of the color preventing any blending of color or outline.

Tempera is probably the most venerable kind of painting, having been used in ancient Egypt, Babylon, and Nineveh, and by the Greeks for interior decoration. It was the favorite medium throughout the Middle Age, even for wall decoration. During the fourteenth and fifteenth centuries the increased technical skill led to the more frequent use of fresco, which had to be executed with great rapidity (see Fresco); but tempera was used for the finishing touches, even by such a consummate master of fresco as Michelangelo. It continued to prevail for panel paintings until the perfection of the new oil medium by the Van Eycks (q.v.) displaced it in the North. In Italy its use lingered until about 1500, nearly all of the greatest paintings of the early Renaissance which are not frescoes being executed in this medium. Tempera painting has been lately revived, with some success, by Baron von Pereira at Stuttgart. A form of tempera in which the colors are mixed with glue is employed in scene painting and house decoration. Consult Hamerton, *Graphic Arts* (London, 1882); Pereira, *Leitfaden für de Tempera malerei* (Stuttgart, 1893).

TEMPERAMENT (Lat. *temperamentum,* due proportion, from *temperare,* to proportion, modify, from *tempus,* time, season: connected with Icel. *þamb,* an outstretching, Lith. *tempiù,* I extend). Emotional constitution, i.e. disposition toward a given type of emotional reaction. An individual's temperament is said, e.g., to be 'impulsive' if the individual responds, as a rule, quickly and with feeling to situations; the temperament of the opposite type is said to be 'cold and sluggish.' The usual classification of temperaments is that formulated by Galen: choleric (energetic, 'objective'), sanguine (warm, impressionable, changeable), melancholic (sentimental and 'subjective'), and phlegmatic (quiet, slow, and persistent). The manner in which these differ both in strength and in the rapidity of alteration in the affective reaction may be expressed as follows:

	Strong	*Weak*
Quick	Choleric	Sanguine
Slow	Melancholic	Phlegmatic

The word temperament is also used more widely to cover any general mental characteristic or aptitude; e.g. 'nervous' or 'musical' or 'artistic temperament.'

Bibliography. Sully, *Human Mind* (New York, 1892); Lotze, *Microcosmus* (Eng. trans., 4th ed., New York, 1890); Wundt, *Physiologische Psychologie* (Leipzig, 1893); Külpe, *Outlines of Psychology* (New York, 1895); Galton, *Natural Inheritance* (ib., 1889). See Tendency; Mental Constitution; Disposition.

TEMPERAMENT. In music, a system of compromise in keyed instruments for the avoidance of the necessity presupposed by the strict relation of musical intervals of having a separate row of keys corresponding to each tonic. Taking C as keynote, the ratios of the notes of the diatonic scale, as derived from the number of vibrations in a given time of a string sounding that note, are:

C	D	E	F	G	A	B	C
24	27	30	32	36	40	45	48

The intervals between these notes are by no means equal, and may be thus expressed in numbers by logarithms:

C D E F G A B C

51 46 28 51 46 51 28

We have here three species of intervals, of which those represented by 51 are called major tones; those by 46, minor tones; and the smaller intervals represented by 28, semitones. These intervals will evidently only serve with C as keynote. If, for example, we start from D instead of C, we find E a tolerable, though not quite correct, second to D; but the third and seventh of the scale are entirely wrong. Were the major and minor tones equal, and each semitone exactly half a tone, the insertion of a note in the middle of each tone dividing the seven intervals would make it immaterial where the scale began, any one of the twelve notes becoming alike available as a keynote; and though such equality is contrary to the immutable principles of harmony, an arrangement based on it is found practically to give but little offense to the ear. In what is called the *equal temperament,* the twelve intervals are all of the same length, and no advantage is given to one key over the rest. This is, in theory at least, the temperament adopted in the pianoforte. By means of this equal temperament it is possible to start from any tone of the scale and, going always by the interval of a fifth, arrive at the same tone six octaves above or below the starting-tone. Acoustically, c^5 is 74-73 higher than the sixth octave of C. Instead, therefore, of using the acoustic fifth the tempered fifth is used, which makes b^4 identical with c^5. Hence the possibility of free modulation through all keys, which in recent times has led to the recognition of tonality (q.v.). As soon as the principle of equal temperament was understood the modern system of major and minor modes displaced the old Church modes. Two of the most active champions of equal temperature were Rameau and J. S. Bach. The former was chiefly the theorist, the latter the practical composer. Bach's immortal *Wohltemperiertes Klavier* was written with the special purpose of introducing the new system of equal temperament.

TEMPERANCE (Lat. *temperantia*, moderation, sobriety, self-control, from *temperare*, to proportion, modify). Primarily, a moderate use and enjoyment of all good things. In modern days the word is often used to designate great moderation in the use of alcoholic beverages, or even total abstinence from them.

Among uncivilized races, ancient and modern, intoxication has been associated with religious ideas and has been encouraged as an incident of religious festivity. As a common vice of appetite it has always been condemned, and in almost all communities in one way or another punished. The earliest attempt at temperance reform is claimed by the Chinese, who affirm that in the eleventh century B.C. one of their emperors ordered all the vines in the kingdom to be uprooted. Early reforms are attributed also to the priests of India and of Persia. The Carthaginians forbade wine in their camps, and to magistrates holding public office. Among the Hebrews there were various sects and orders which abstained from the use of intoxicants. The Buddhists taught total abstinence. The Christian Church made some attempt to bring about a more moderate use of the wine-cup. Saint Gildas dealt out severe punishment to any churchman guilty of drunkenness. Dunstan is said to have labored in the cause of temperance in England to the end that King Edgar at his instance restricted the number of taverns and the quantity of intoxicants that might be sold. By a law of 1285 taverns in London were required to close at curfew. From 1603 legislation against ale-houses and drunkenness increased. In 1736 Parliament attempted to restrict the use of gin by means of a prohibitory tax, which, however, only brought about an illicit trade.

United States. In April, 1808, a society was formed at Moreau, Saratoga County, New York, consisting of 43 members, and providing in their Constitution that "no member should drink rum, gin, whisky, wine, or distilled spirits, ... except by advice of a physician or in case of actual disease (also excepting at public dinners), under penalty of twenty-five cents; . . . . provided that this article shall not infringe on any religious rites." This society existed for fourteen years, but accomplished little. The American Temperance Society was founded in Boston, February, 1826, and the New York State Temperance Society in 1829. By 1830 the latter society numbered 100,000 members. In 1833 prominent members of Congress organized the Congressional Temperance Society. Before the Civil War a number of secret societies were established for the promotion of temperance. They required a pledge of total abstinence, advocated prohibition, and tried to educate public sentiment in favor of reform. They also provided the usual beneficiary features and opportunities for self-culture. The Sons of Temperance, founded in 1842, grew rapidly in membership and influence. (See Temperance, Sons of.) The Independent Order of Good Templars was started in New York in 1851. It spread over the whole world. (See Good Templars, Independent Order of.) The Templars of Honor and Temperance (1845) were strong in the South. Later benefit but non-secret societies are the Royal Templars of Temperance (Buffalo, 1869), and the Templars of Temperance, an order strong in England and the Scandinavian countries. After the Civil War the consolidation of societies began. In 1865 the National Temperance Society and Publication House was organized at Saratoga, as a non-partisan and non-sectarian society, advocating total abstinence. This society published and distributed pamphlets, text-books, and papers, held public meetings, and called national and international conferences. The Women's Crusade led to the organization in 1874 of the Woman's Christian Temperance Union (q.v.). In 1868 a prohibition party was organized in Illinois and a temperance political party in Michigan. The call for a convention came from the Grand Lodge of Good Templars. The National Prohibition Party was organized in Chicago in September, 1869. (See Prohibition.) Law and Order Leagues were established to see that existing legislation is properly enforced (Chicago, 1872; New York, 1877; Philadelphia, 1880; Massachusetts, 1882). In 1883 the general society—the Citizens' Law and Order League of the United States—was formed.

Great Britain. In August, 1829, a temperance society was started at New Ross, County of Wexford, Ireland, whose members pledged themselves to abstain from liquors, except as medicine. At the same time a similar movement began in the north of Ireland. Within twelve months there were sixty societies, with 3500 members. The Glasgow and West of Scotland Temperance Society was founded in November. Up to this time the moderate use of liquor was permitted, but John Dairé and others of the Society of Dunfermline pledged themselves to total abstinence and began to form total abstinence societies. The first. societies in England were established at Bradford, Warrington, and Manchester in 1830. The British and Foreign Temperance Society, founded in London (June, 1831), through the influence of William Collins of Glasgow, was for some years the leading temperance society in England. It was the first to start a crusade against beer. The movement for total abstinence had its beginning at Preston in Lancashire. After the formation of the Youth's Temperance Society at Preston in 1834, and its extension to other forms, a conference was held at Manchester, resulting in the organization of the British Association for the Promotion of Temperance, on the Principle of Total Abstinence from all Intoxicating Liquors. Thereupon the total abstinence element struggled for recognition in the British and Foreign Temperance Society. In August, 1836, the teetotal society was merged into the New British and Foreign Society for the Suppression of Intemperance. The later periods of temperance work in Great Britain may be designated by: (1) the Father Mathew crusade in 1838, during which in two years 1,800,000 people took pledges in Ireland; (2) the beginning of work among children through the formation of Bands of Hope, in 1847; (3) the John B. Gough (q.v.) mission in 1858;

(4) the introduction of Good Templarism, in 1868; and (5) the organization of the Blue Ribbon Army on February 10, 1878, now the Blue Ribbon Gospel Temperance Movement with branch organizations, the Help Myself Societies for men and the Help One Another Societies for women. The United Kingdom Alliance (1853) urges prohibition upon Parliament.

The temperance movement in America and Great Britain has been characterized by the emotionalism of religious revivals. Prayer and conversion were offered as aids to reform. Many religious organizations as such have interested themselves in temperance work. The Methodist Church from the days of the Wesleys has advocated total abstinence. The Friends were opposed to drinking, and among the Dunkards abstinence was a test of fellowship. Since the beginning of the nineteenth century, Baptists, Congregationalists, and Presbyterians have been opposed to drinking. In the United States church members are more often connected with non-sectarian organizations. Among the general church organizations are: The Congregational Total Abstinence Association (1874); The Baptist Total Abstinence Association (1874); the Total Abstinence Society of the Presbyterian Church of England (1892); a number among various Methodist sects; Church of England Temperance Society (1862, reorganized 1873), formed to promote temperance, to study the causes of the abuse of alcohol, and to do rescue work. The Roman Catholic Church advises moderation, but where this is impossible, total abstinence. In 1902 the Catholic Total Abstinence Union of America (q.v.) contained about 80,000 members. In Great Britain the League of the Cross was inaugurated by Cardinal Manning in 1873.

Medical men have formed societies, such as the British Medical Temperance Association, (1872) advocating total abstinence and making investigations, and the American Medical Temperance Association (1891). Some labor unions, especially the Knights of Labor, have discouraged the use of intoxicants. Farmers' associations, such as the National Farmers' Alliance and the National Grange, have put themselves on record as opposed to the liquor traffic. Among the many children's societies that have been organized are: the Cold-Water Army (1828); juvenile branches or cadets of secret societies; Bands of Hope; and the Loyal Temperance Legions of the W. C. T. U. In opposition to temperance reformers, liquor manufacturers and dealers have organized to prevent hostile legislation. In 1862 the United States Brewers' Association was formed to oppose the internal revenue taxes and prohibition. In Illinois the brewers organized, purchased saloon sites in Chicago, and established cheap saloons conducted by agents. The Liquor Dealers' and Manufacturers' State Protection Association of Illinois is another association of liquor men.

In August, 1846, a World's Temperance Congress was held in London, at which 302 delegates were present. Since then there have been other international conventions, notably the World's Temperance Congress of 1893 at Chicago. At this meeting the economic aspects of the problem, especially the cost to the workingman, were emphasized. There was a general feeling in favor of total abstinence among English and Americans, while the Europeans advocated moderation and the drinking of wine. In Canada and Australia the movement has progressed along the same line as in England and America.

Scandinavian Countries. Drunkenness has been a serious vice in Sweden and Norway. Various temperance societies have been organized, and the efforts to solve the question by means of the Bergen system of monopoly in Norway and the Gothenburg system (q.v.) in Sweden have received much comment.

Germany. The German Temperance Society was organized in 1837, but the national custom of beer-drinking lessens the importance of the liquor problem in that country.

Austria. Only recently has a temperance movement been organized. The Society for Checking Inebriety was started in 1884.

Belgium has several temperance societies, among them the Association Against the Abuse of Alcohol (1878).

Switzerland has a total abstinence movement, superseding societies advocating moderation. The Blue Cross Federation was founded in 1877.

Latin Countries. Spain, up to 1860, was a sober country. Since then a slight increase in drunkenness has been due to the adulteration of wines, which has caused the people to use spirits. There is no active temperance movement, however. Since the destruction of the vines has led the poor of France to drink adulterated spirits. drunkenness has increased, and there is a decided temperance movement in favor of moderation rather than total abstinence.

Russia. Drunkenness has been a great vice in Russia. The peasant drink vodka is particularly intoxicating. Various temperance societies exist. Since January, 1895, the Government has acted as middleman, not maintaining a monopoly, but regulating and limiting the sale of liquor, and analyzing it to ascertain its purity. A large revenue is obtained in the provinces where this system has been established, and the system is being extended to other provinces.

General Considerations. (1) *Economic Aspects.*—A large amount of capital is invested in the liquor business—vast manufacturing plants (breweries and distilleries), and the property, fittings, and money paid for bonds and licenses necessary for the retail trade. For example, in June, 1896, there were 6187 distilleries in the United States, producing 89,992,555 gallons, and 1866 breweries, producing 1,111,636,750 gallons. The capital invested by 1924 firms was $269,270,249, and 41,425 people were employed. National, State, county, and municipal governments often have an interest in the traffic, through the levying of taxes upon it. In 1896 liquor taxes amounted to $164,016,401.68. These taxes are important as revenues, especially to small localities. The cost of liquor-drinking to the consumer is great, since the money spent on liquor is diverted from more useful expenditures. Chicago's drink bill in 1894 was $70,000,000. In 1896 the consumption per capita in the United States was 16.42 gallons. An important economic consideration for the community is the cost of maintaining criminals and paupers made so by the abuse of intoxicants.

(2) *Relation to Poverty.*—Drunkenness makes greater ravages among artisans than among paupers. Warner's tables show that it was

the direct cause of distress only in 15.28 per cent. of the cases investigated. Drinking to excess is rather a symptom than a source of degeneration, and develops in a people of natural strength exhausted by vice, overwork, and conditions of life that undermine health. The children of drunkards are frequently idiots or insane.

(3) *Legislative Aspects.*—Various attempts have been made to control the liquor traffic by legislation, while certain regulations have always been considered necessary. The national Government, since 1789, has placed internal revenue taxes and some customs duties upon liquors. Congress also has passed laws regulating the sale of liquor to Indians and soldiers and the sale in the District of Columbia, and requiring the scientific study of temperance in the schools of the District of Columbia, military, Indian, and Territorial schools. In the States the methods used to control the liquor traffic are: (1) licenses; (2) local option; (3) prohibition; (4) dispensary system. It has been customary from the earliest times to license the sale of liquor. The modern issue has been that of high license ($500.00 or more), which its advocates claim lessens the number of saloons and improves their character. High licenses prevail in large cities. The laws of Massachusetts and Pennsylvania are considered the most successful. Local option has the advantage of the support of public opinion. The earliest laws were those of Connecticut (1839) and New York (1845). Prohibition exists in Maine (1846; in Constitution 1884), and Kansas (in Constitution 1880), Iowa, and North and South Dakota. Kansas, however, has practically local option. There is no attempt at concealment, and since the hard times of 1890 the fines for breaking the law have been regularly counted upon as revenue by some cities. Vermont and New Hampshire, after a long experience with prohibition, have adopted local option. Where prohibition exists the question of compensation for those engaged in the liquor traffic has come up for judicial decision. As a result the National Anti-Nuisance League was organized in 1888 to push cases. South Carolina alone has the dispensary system, or State monopoly of the liquor traffic. The law was passed December 24, 1892. The advantages claimed for this system are: that personal profit is eliminated; purity and an honest measure are guaranteed; treating is impossible; sales are made in the daytime and for cash, and the concomitant temptations are removed. Other laws relating to the liquor traffic regulate the hours of closing and the sale on Sunday, the sale to minors and drunkards, the situation of saloons and their accompaniments in the way of pool, games, theatres, or other attractions.

REMEDIES. The arguments advanced against the use of alcoholic drinks have been: (1) Scriptural, based on a supposed distinction in the Bible between fermented and unfermented wine, as shown by the use of the Hebrew words *yayin* and *tirosh;* (2) physiological, which claims alcohol to be a poison and which shows that temperance conduces to health; (3) social, viewing alcohol as a cause of crime, vice, and poverty; and (4) economic, in that the manufacture and consumption of alcohol are nonproductive and a great waste of material. The remedies offered by the early temperance movement were reformatory and preventive. Moral suasion was used, and drinkers were urged to sign the pledge and to strengthen themselves by the aid of prayer and religion. Total abstinence was demanded of the strong to help the weak. Prohibition was urged in order to remove temptation. Homes and asylums were established, as the Washingtonian House in Chicago and the Franklin Home, Philadelphia. The prevention work was largely educational through the distribution of literature, lectures, the formation of societies, and the preparation of text-books for use in the public schools. Business considerations now exert an important influence. In positions of responsibility or where accidents are likely (such as engineers, foremen, watchmen) drinking is prohibited. The habits of applicants for employment are carefully scrutinized, especially in the business of transportation. Even where moderation is overlooked, excess is never tolerated. Saloon property pays a higher insurance rate. Some life insurance companies refuse to insure men engaged in the liquor business.

BIBLIOGRAPHY. Important contributions to the study of the liquor problem have been made by the Committee of Fifty formed in 1893 and comprising representative men in the fields of education, religion, and sociology. The committee had its origin in a group of men who, beginning in 1889, had associated themselves for the purpose of pursuing the study of practical problems in sociology. Papers written by various members and criticised by all were published in the *Century Magazine* and the *Forum.* Meetings of the committee take place twice a year in New York. Four sub-committees deal with the different aspects of the liquor problem, physiological, legislative, economic, and ethical. The publications of the committee comprise: (1) Wines and Koren, *The Liquor Problem in Its Legislative Aspects* (Boston and New York, 1897); (2) Koren, *Economic Aspects of the Liquor Problem* (ib., 1899); (3) Calkins, *Social Substitutes for the Saloon* (ib., 1901); (4) Billings, *Physiological Aspects of the Liquor Problem* (ib., 1903); *Twelfth Annual Report of United States Commissioner of Labor* (1897); "Economic Aspects of Liquor Problem," *Cyclopedia of Temperance and Prohibition* (New York, 1891); *Temperance of All Nations,* edited by Sterns (Papers of World's Temperance Congress, 1893, New York, 1893); Tracts, Publications, and files of papers of W. C. T. U. and temperance societies; Samuelson, *The History of Drink* (London, 1880).

TEMPERANCE, Sons of. An order founded in New York in 1842 with the object of making the great temperance movement of that period permanent. It has life insurance, sick and funeral benefit features. There are male and female members and there is a cadet branch for boys of sixteen years, who are known as the Cadets of Temperance, and who subscribe to a pledge which binds them to avoid all connection with the use, sale, or manufacture of spirituous liquors. There are four grand divisions of the order, one in England, where it was introduced in 1846, two in Australia, and one in North America. About one-half of the members are in the United States and it is estimated that 3,000,-

000 members have been on the rolls since the organization of the order. The ritual is very impressive. The order is now established in Great Britain, Ireland, the Bahamas, Liberia, New Zealand, Australia, Scotland and Wales.

TEMPERATURE. See Heat.

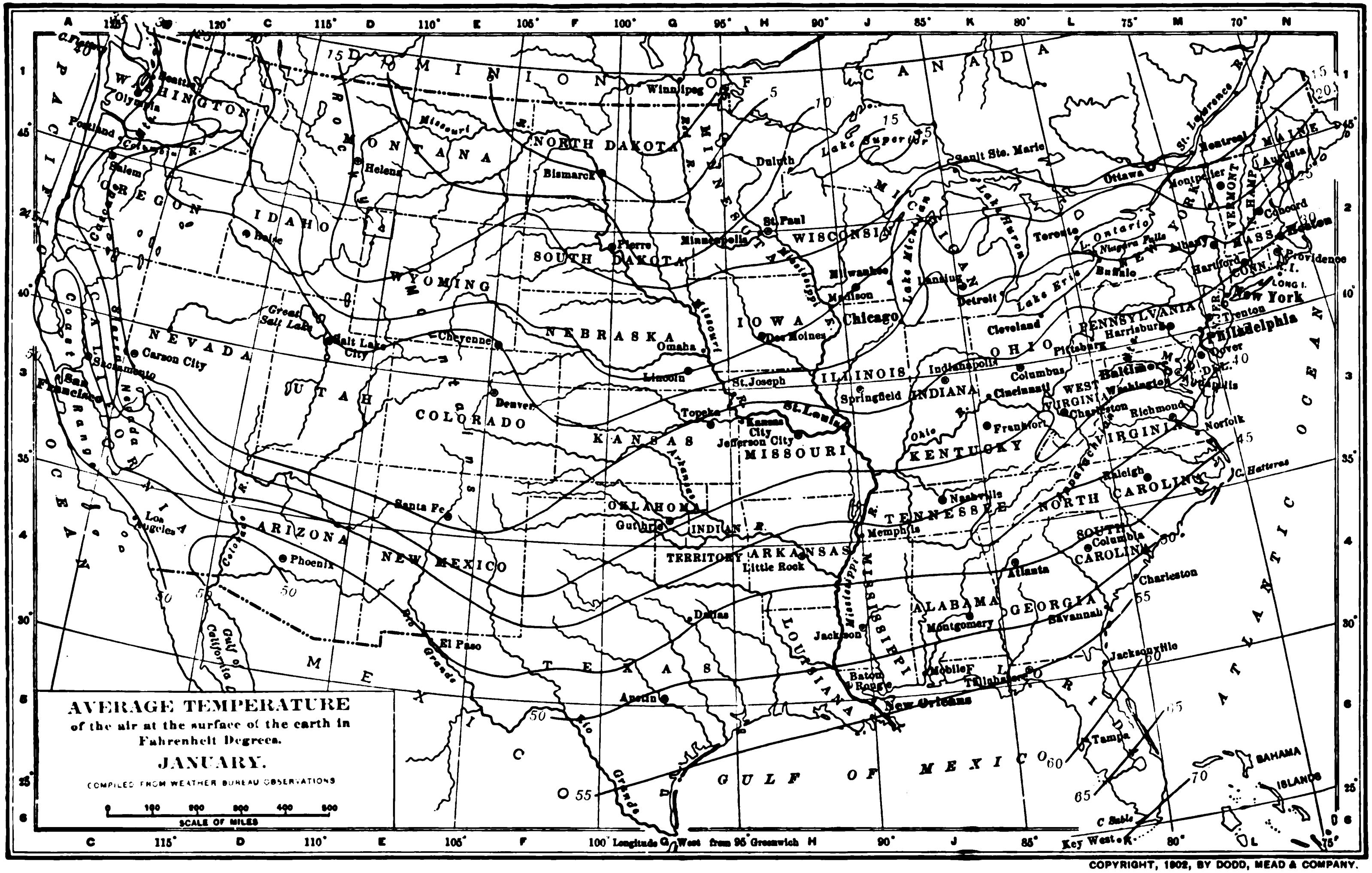
TEMPERATURE, Terrestrial. The distribution of heat in the atmosphere depends to some extent on its direct absorption of solar radiations, and especially the absorption at the upper surface of the clouds, but is principally governed by the angular altitude of the sun and the contact of the air with the ground and the ocean. The numerous irregularities give rise to the great currents of air as well as to the local winds, and the latter carry the heat and the temperature rapidly from one part of the globe to the other, so that ultimately the atmospheric temperature is almost equally controlled by the winds on the one hand and the oceans, continents, rain, snow, and cloud on the other. The typical continental climates experience great diurnal and annual ranges of temperature, and the typical oceanic climates show a small range.

The distribution of temperature on any level surface at any depth below or height above sea level is shown by means of isotherms, which are drawn through all places that have the same temperature at any moment, or the same monthly or annual mean temperature. Charts showing these isotherms have been published by various meteorological services for the air and the land, and by various hydrographic offices for the oceans. The highest mean annual temperatures occur within the tropics and especially over the land areas of Northern Africa and Southern Asia, with corresponding small regions in Central America and the northern portion of South America. The lowest mean annual temperatures are found in Northern Siberia and the northern portions of British America, which represent the southern extension of a large Arctic area of low temperature. See Climate.

TEMPERATURE OF THE BODY. The temperature in the healthy human adult averages from 98.4° to 98.6° F., but 97.5° and 99° F. are within normal limits. In the new-born child the temperature is slightly above the average, as it is in old age. Race has but a slight influence, a difference of .29° F. being observed between the nations of Southern Europe and those of the northern part. The temperature rises slightly after a meal and during exercise. During the day the body heat varies about half a degree, being highest between 5 and 8 P.M. and lowest between 2 and 6 A.M. In childhood the temperature is easily and rapidly influenced, slight ailments causing marked febrile reaction. The temperature is registered by means of the clinical thermometer, which is self-registering, placed in the mouth, axilla, fold of the groin, the rectum, or the vagina. The surface of the body is slightly cooler than the interior. A temperature below 93° or above 108° F. is almost always fatal. The usual range in fevers is between 99.5° and 105° or 106° F. As a rule there is a constant relation between the amount of fever and the rapidity of the pulse (q.v.) in many people. A pulse of 80 indicates a temperature of 100° F.; a pulse of 90, a temperature of 101° F., etc. A rise of temperature between 99° and 102° F. is termed slight or moderate pyrexia; from 101° to 105° severe pyrexia; and above this point hyperpyrexia. Many chronic and a few acute diseases are characterized by a subnormal temperature. This is observed in hemorrhage, starvation, and wasting from chronic diseases. In the melancholia of certain mental troubles there may be great depression both of the general and surface heat. An elevation of temperature attends by far the greater number of diseases. In the great class of the acute general infections (see Nosology) an elevation of the body heat is the most important symptom and is proportional to the severity of the disease. Very marked elevation of temperature (hyperpyrexia) is seen in tetanus, acute rheumatism, pernicious malarial fever, and after injuries to the spinal cord. In tetanus the thermometer may register as high as 112.5° F. In sunstroke or heat-stroke, an equally high point has been reached. Lastly, the temperature may rise just before death, and after it, in *rigor mortis*. See Animal Heat; Fever; etc.

TEMPERATURE VARIETIES. Varieties, races, or sub-species are largely differentiated by variation resulting from being subjected to different influences, principally in the nature of temperature and comparative moisture. It is a matter of universal observation that widespread species present a great range of variability in size, proportion of parts, color and other characteristics, so that it is often a matter of doubt whether a variant ought to be classed as a geographical sub-species, or as a distinct species. When it appears that the same kind of variation affects all or nearly all of the animals of a certain class in a region, coincidently with the character of the local climate, it is fair to assume that the change from the normal noted is due to local climatic influence. Temperature seems to act most directly in producing the common form of seasonal dimorphism, which affects most of the higher animals that dwell in the temperate zones, and are called upon to endure the cold of winter as well as the heat of summer. This causes a semi-annual change in mammals and birds from a comparatively thin and short coat of hair or feathers in the warm half of the year to a thicker and longer covering more suitable to the cold season. In addition to this there is always a greater or less change of color, the bright dress of summer, assumed after the spring molt, falling out in the autumn and being gradually succeeded by a plainer, less conspicuous suit for the winter months. The difference is often very great; and in the arctic regions amounts to a change from decided colors in summer to pure white in winter.

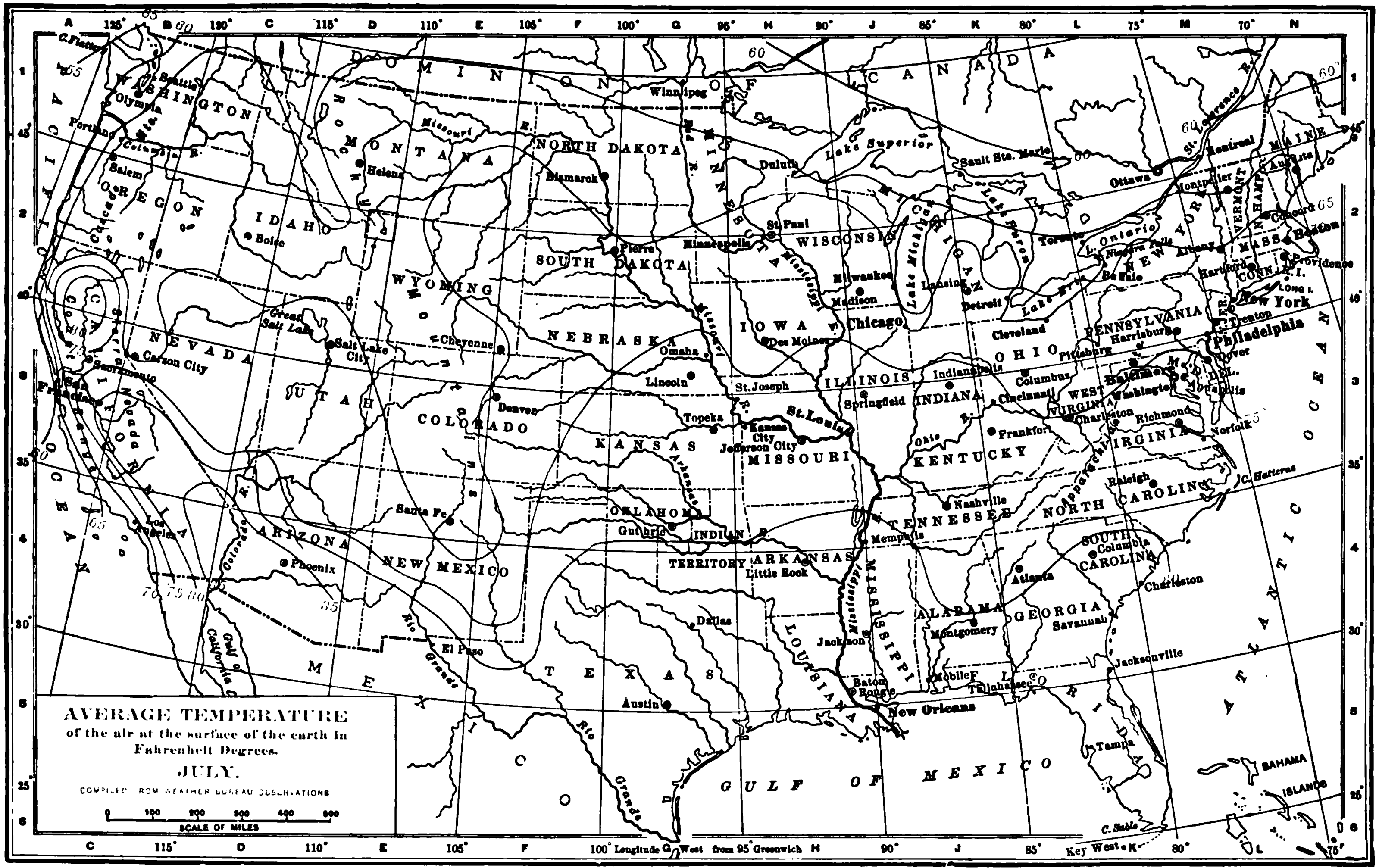
The comparative degree of average moisture in the air of two regions will be reflected in the colors and other features of the same species of animals inhabiting them; those of the moist region will have darker colors, and a tendency to larger size and proportionally longer external parts, as bills, legs, and tails, than the dry land species, which will be more pale in color and compact in form. Dr. J. A. Allen has shown this very conclusively in his investigations upon North American birds. Let one of these



AVERAGE TEMPERATURE
of the air at the surface of the earth in Fahrenheit Degrees.

JANUARY.

COMPILED FROM WEATHER BUREAU OBSERVATIONS



AVERAGE TEMPERATURE
of the air at the surface of the earth in
Fahrenheit Degrees.

JULY.

COMPILED FROM WEATHER BUREAU OBSERVATIONS

COPYRIGHT, 1902, BY DODD, MEAD & COMPANY.

districts be severed for a considerable period from the others and the results accredited to isolation (q.v.) would follow; but the species so formed might well be called 'temperature species' in reference to their origin. Geographical races may therefore be regarded as incipient species.

That changes from heat to cold, wetness to dryness, or the reverse, in the climates of regions of the world in the course of its history since animal life appeared upon it, have been efficient factors in species-making, may well be believed.

See Evolution; Melanism; Isolation; and consult authorities there mentioned.

TEMPERING STEEL. A peculiar effect is produced upon steel by heating it to redness, and then suddenly cooling it. By this means, extreme hardness is obtained. Steel is so susceptible to this process, called tempering, that almost any degree of hardness and brittleness can be obtained. If, for instance, we make a piece of steel red hot, and then plunge it into cold water, it becomes hard and brittle when cold, and is actually, though slightly, increased in bulk. But if we reheat the metal, and allow it to cool slowly, it again becomes soft and malleable as before. Moreover, if we again reheat it, but not to redness, and cool it suddenly, it is still further softened. If, before reheating, the surface has been polished, a beautiful shade of color is produced by the heat, which is varied according to the temperature employed; and so exactly is this the case, that the experienced manipulator is guided by the color produced, instead of by nice regulations of the heat applied. For ordinary operations, the metal is cooled by plunging it in cold water; but oil, mercury, and saline solutions are used for special purposes. An exact series of experiments has proved that the following colors are produced at the temperatures given: very pale yellowish, by 430° F.; pale straw, 450°; yellow, 470°; brown, 490°; mottled brown, 510°; purple, 530°; bright blue, 550°; blue, 560°; dark blue, 600°. See Annealing; Iron and Steel.

TEMPEST, The. A play by Shakespeare, first acted in 1610, though Fleay suggests that its present form was abridged perhaps by Beaumont about 1613 for a Court performance, the wedding of the Princess Elizabeth. Sidney Lee also doubts that it was originally written for this occasion. It was first printed in the Folio of 1623. The sources are principally books of travel: Eden's *History of the Travaile* (1577), Raleigh's *Discovery of Guiana* (1596), and S. Jourdan's *Discovery of the Bermudas* (1690), telling of Sir George Somers's fleet at Bermuda in 1609.

TEMPESTA. See Mulier.

TEMPLARS, Knights. A religious and military order of the Middle Ages, the great rival of the Knights of Saint John of Jerusalem. In 1119 Hugues de Payens and Geoffrey de Saint-Adémar (Saint-Omer), with seven companions, formed a military band to protect pilgrims in Palestine. They adopted the rule of Saint Augustine, and took the name Knights of Christ. But as quarters were assigned to them in the palace at Jerusalem, known as Solomon's Temple, they soon were called Knights of the Temple, or Knights Templars (*milites templi*). In 1128 at the Council of Troyes a rule, inspired by Saint Bernard, and closely following the Cistercian, was given them.

The order grew rapidly. At the end of the thirteenth century it had about fifteen thousand members, and in the middle of the same century it is said to have owned nine thousand castles and manors. It was free from all taxes and was under the jurisdiction of the Pope alone. As the order had to make regular transfers of supplies and money from Europe to Palestine, they developed an effective banking system. Their strong and well-manned 'temples' were the safest places for depositing treasure and documents and for a time the Templars were the bankers of Europe. There were three ranks in the order, knights, chaplains, and servants. The knights, few in number, were the real Templars. They directed the affairs of the order, and they alone could wear the white mantle with its red cross. At the head of the order was the grand master. The capital of the order was at Jerusalem till 1187, and then successively at Antioch, Acre, and Cæsarea, and after the extinction of the Christian power in Syria (1291), in Cyprus. The standard of the order, called *Beauséant*, was half black, half white, with the motto *Non nobis Domine*. The Templars' wealth, pride, and power brought them into conflict with Church and State. With the decay of the crusading spirit their activity was more feared, and in the latter half of the thirteenth century opposition grew rapidly. They had made enemies in other military orders and among the monastic orders. Their adoption of Oriental customs and the secrecy of their rites impressed popular imagination. They were charged with many evil and sacrilegious practices. The direct attack on them came in France. Philip IV., under the influence of Guillaume de Nogaret, saw his chance to be rid of an insubordinate order, and to increase his wealth. He got Pope Clement V. to aid him. On October 13, 1307, the grand master, Jacques de Molay (q.v.), with all the Templars, was arrested without warning. Their trial was in charge of the Inquisitor for France. Most of them under torture confessed to some or all of the charges against the order. Many of them afterwards retracted, including Molay. A large number were burned at the stake, Molay himself being spared for a number of years. In 1311 Clement called the General Council of Vienne, chiefly for the purpose of suppressing the order. When the council persisted in demanding that the question should be tried strictly as a judicial question without any regard for policy, Clement held a secret consistory, March 22, 1312, at which the suppression was decreed. On April 3d the bull *Vox in excelso* was published declaring the reasons for the Papal condemnation. On May 2d the bull *Ad providam* was issued decreeing the final abolition of the order. Its property went to the Hospitalers; but the seizures of Philip were confirmed to him. Jacques de Molay was burned in 1314.

Consult: Curzon, *La règle du temple* (Paris, 1886); Gmelin, *Schuld oder Unschuld des Tempelordens* (Stuttgart, 1893); Lea, *History of the Inquisition*, vol. iii. (New York, 1888).

TEMPLE. A building consecrated to religious worship, especially among pagan peoples. The term is also applied to the chief sanctuary of the Jews (see Temple at Jerusalem), to Christian churches belonging to the Knights Templars, and in France to Protestant places of worship. A temple was usually dedicated to some deity, whose image it contained; the interior was accessible to priests, but not to the general body of worshipers. Among most ancient peoples the temple was the principal architectural feature, as in Greece, where the history of temple construction is practically the history of architecture. The subject is therefore best treated under the subdivision *Architecture*, in such articles as Assyrian, Babylonian, Egyptian, Greek, Roman, Indian, Chinese, and Japanese Art; also under Architecture, Ancient American.

TEMPLE. A city in Bell County, Tex., 35 miles south by west of Waco; on the Gulf, Colorado and Santa Fe and the Missouri, Kansas and Texas railroads (Map: Texas, F 4). It has a public library, King's Daughters' Hospital, and the Gulf, Colorado and Santa Fe Railroad Hospital. Temple is the shipping centre for the cotton, corn, oats, and live stock of the surrounding country. Cottonseed-oil mills, cotton gins and compresses, foundries and machine shops, bottling works, a large cold storage plant, flouring mill, and a candy factory are among the leading industrial establishments. The Gulf, Colorado and Santa Fe Railroad maintains shops here. The government is vested in a mayor, chosen biennially, and a unicameral council. Temple was settled in 1881. Population, in 1890, 4047; in 1900, 7065.

TEMPLE, The. (1) A former stronghold of the Templars in Paris, built in 1212. When the order was suppressed in 1312 it was used as a royal treasury and subsequently as a prison. During 1792 and 1793 Louis XVI. and his family were confined in it. The last remains of the building were removed in 1871 and its site is now occupied by the Marché du Temple. (2) A former lodge of the Templars in London, dating from the end of the twelfth century, and now represented by the Temple Church and the Inns of Court, known as the Inner and Middle Temple, which stand on the site of the ancient building, the former within the precincts of the city. The Temple became Crown property when the order was dissolved, was presented to the Earl of Pembroke, and then passed to the Knights of Saint John, who leased it to law students.

TEMPLE, Frederick (1821-1902). Archbishop of Canterbury. He was born at Leukas, in the Ionian Islands, and was educated at Balliol College, Oxford. He was principal of Kneller Hall, and then inspector of church training-colleges, until he was elected head-master of Rugby, where his administration was very successful. In 1860 his name was prominent as one of the authors of *Essays and Reviews*, a book supposed to have a rationalizing tendency, though Temple's own essay on "Education and the World" contained little that would be considered dangerous nowadays. The suspicion of heterodoxy, however, clung about him and found expression when Gladstone, in 1869, nominated him as Bishop of Exeter, in a formal protest against his confirmation. This distrust died away afterwards and he acquired a great reputation for absolute justice and impartiality, while in many respects his later career associated him rather with the High Church party than with the Broad. In 1885 he was translated to the see of London, and in 1896 he was made Archbishop of Canterbury, and a year afterwards, with his brother primate of York, stood out as a champion of the Church of England in a learned and dignified reply to the Papal decision declaring the invalidity of Anglican ordination. He died in London soon after officiating at the coronation of Edward VII. His most important published work is *The Relation Between Science and Religion* (1884), being the Bampton Lectures for that year. Consult biographies by Aitken (London, 1901) and Dant (ib., 1903).

TEMPLE, Henry John, third Viscount Palmerston. A British statesman. See Palmerston.

TEMPLE, Sir Richard (1826-1902). An English politician and author, born at Kempsey, near Worcester. Having entered the Indian service in 1848, he rose quickly, becoming Finance Minister of India (1868), Lieutenant-Governor of Bengal (1874), and Governor of Bombay (1877-80). On his return to England in 1880 he became financial member of the London School Board (1886-94), and president of the Social Science Congress. From 1885 to 1895 he sat in Parliament as a Conservative. For his services he was made a baronet in 1876. His publications comprise: *India in 1880* (1881); *Men and Events of My Time in India* (1882); *Oriental Experience* (1883); *Cosmopolitan Essays* (1886); *Palestine Illustrated* (1888); *Memoir of John Lawrence* (1889); *Life in Parliament* (1893); *Story of My Life* (1896); *A Bird's-Eye View of Picturesque India* (1898); and *The House of Commons* (1899).

TEMPLE, Richard Temple Grenville, Earl (1711-79). An English statesman. He was the eldest son of Richard Grenville of Wotton Hall, Buckinghamshire, and was educated at Eton and privately. In 1734 he was returned to Parliament for Buckingham. On the death of Viscount Cobham in 1749 his mother was created Countess of Temple and at her death in 1752 Grenville succeeded to the Temple earldom. He was a political associate of William Pitt, who married Grenville's sister Hester, and he held the position of First Lord of the Admiralty, 1756-57, and Lord Privy Seal, 1757-61. He was afterwards in frequent opposition to the King, Pitt, and his brother George Grenville, supported Wilkes, and was one of the many to whom the authorship of the *Letters of Junius* was attributed. Consult the *Grenville Papers* (1852-53), which consist of the correspondence between Pitt and George and Richard Temple and throw much light on the political and Court life of the period.

TEMPLE, Sir William (1628-99). An English statesman and essayist, born in London. He was reared by an uncle, Dr. Henry Hammond, rector of Penshurst, in Kent. He entered Emmanuel College, Cambridge, in 1644; but he left four years later without a degree, and set out for France. On this journey he met Dorothy Osborne (1627-95), the daughter of a stanch royalist, whom he married in 1655. Dorothy's letters during the last years of the courtship possess great charm. In 1665 Temple was sent to Westphalia on a secret mission to the Bishop of Münster. On his return (1666) he was created a baronet, and appointed resident at the Court of Brussels. His most important diplomatic success was the famous treaty of 1668, known as the Triple Alliance, by which England, Holland, and Sweden bound themselves to unite in curbing the ambition of France. Temple was long Ambassador at The Hague and helped to bring about the marriage of the Prince of Orange with the Princess Mary (1677). In 1679 Charles II. urged him to become his Secretary of State. Though Temple refused this post, he attempted to reform the government by establishing a privy council of thirty members, by whom the King promised to be guided in all public affairs, but this council proved an utter failure. Temple soon abandoned politics and retired, first to Sheen, and then to Moor Park in Surrey, where for the last ten years of his life he devoted himself to landscape gardening and to literature. During this period he received into his household as amanuensis, and afterwards as secretary, Jonathan Swift (q.v.), who ultimately became his literary executor.

As a writer Temple is now known chiefly by his historical *Memoirs* (unauthorized ed. 1691; 1709) and his *Miscellanea* (1680; 1692). In the series of 1692 first appeared the famous essay on Ancient and Modern Learning, which deals with the comparative merits of ancient and modern literature. The outcome of the spirited controversy in England was Swift's *Battle of the Books* (1704). (See BATTLE OF THE BOOKS.) Temple has been considered one of the reformers of English style. According to Dr. Johnson he was "the first writer to give cadence to English prose." During the eighteenth century Temple's essays were regarded as models; his English was particularly pleasing to Charles Lamb, who comments upon it in his "Essay on the Genteel Style." But the later tendency toward limpidity in prose writing leaves Temple's work with little more than an historical value. Consult his *Works* (London, 1814); the *Life, Works, and Correspondence*, by Courtenay (ib., 1836); and Macaulay's article on this biography in the *Edinburgh Review* for October, 1838 (reprinted in *Essays*); Dorothy Osborne's *Letters*, ed. by Parry (London, 1888).

TEMPLE AT JERUSALEM. The central shrine of Judaism after the establishment of the Davidic monarchy, situated on Mount Moriah in Jerusalem. The first 'house of God' was the Tabernacle or Tent of Meeting, described in Exodus xxv.-xxvii.; but this was replaced during Solomon's reign (c.977-937 B.C.) by a permanent structure of great magnificence. This is described in great detail in II. Chronicles iii.-iv. (more briefly in I. Kings vi.); but, although certain features of the design are clearly set forth, others are wholly passed over, so that efforts to restore it from these descriptions have produced an extraordinary variety of results. It is, however, evident from the descriptions that the Temple followed the general plan of the Tabernacle with its inclosures, but on double the scale. The arrangement of the Tabernacle, with its outer court, inner court, sanctuary or Holy Place, and Holy of Holies, resembled in its general scheme that of the Egyptian temples (see EGYPTIAN ART); but the Tent itself was of modest dimensions, the Holy of Holies forming a cube of 10 cubits or about 15 feet, and the sanctuary a double cube 10 by 10 by 20 cubits. The Temple proper of Solomon measured 60 cubits in length, the outer sanctuary or Holy Place being 20 by 40 cubits in size and the Holy of Holies 20 by 20 cubits; both were 20 cubits high. Within the latter was the Ark of Testimony under two cherubim with outspread wings; in the Holy Place were the altar of incense, the show-bread table, the seven branched candlesticks, and ten smaller tables and candlesticks. Both chambers were wainscoted with cedar and wholly covered with gilding; they were separated by a 'veil' or fixed curtain fitted with an olive wood doorway and doors. It was this veil that was 'rent in twain' at the crucifixion (Matt. xxviii. 51; Mark xv. 38; Luke xxiii. 44). The golden candlestick carried by Titus to Rome in A.D. 70 is figured in a relief on the Arch of Titus.

In front of the Temple porch were two columns of bronze, 'Jachin' and 'Boaz,' 23 cubits high; and against its side and end walls were three stories of small chambers for the priests. The court immediately surrounding the Temple was reserved for the priests, and contained the brazen altar of burnt offering and the great bronze 'Sea,' or tank, borne on twelve bronze oxen; these, with the cherubim in the Holy of Holies, being the only examples of free sculpture in Jewish art. A second court was the place of general assembly for all Jewish worshipers; it preceded or surrounded the first; but whether built by Solomon or encircled at a later date is not certain. Solomon's palace and the 'House of the Cedars of Lebanon' adjoined the Temple court. Dependencies and outbuildings were added at various times to the main group. Of the architectural style of the Temple there is little hint in Scripture; but we know that its builders were chiefly Phœnicians, and the combination of an Egyptian type of plan with such Assyrian decorative details as palms, cherubim, and 'knops and flowers' is quite in harmony with the mixed style of Phœnician work in general.

Solomon's Temple was destroyed by Nebuchadnezzar B.C. 586. Upon the return of the Jews from the Babylonian captivity by permission of Cyrus a new edifice was erected under the direction of Zerubbabel and finished B.C. 516. The vision of this second temple given by Ezekiel (chapters xl.-xliii) is generally recognized as something more than a mere creation of fancy. Though vague in many points, it is consistent and detailed in others, representing a far more elaborate system of courts, inclosures, gates, and porticoes than the first temple possessed. The temple proper was a reproduction of the original edifice, but far inferior to it in splendor of ornament and gilding. Both the first and second edifices were, however, surpassed in architectural splendor by the third temple, erected by Herod, B.C. 18. The area of the temple terrace was greatly enlarged by new substructures built with masonry of colossal magnitude, a section of which forms the present 'place of wailing' of the Jews. Marble was profusely used for colonnades, gates, and walls, and the magnificence of Roman carved decoration and architectural detail was blended with the Oriental arrangement of the plan, which reproduced essentially the disposition of the two preceding structures, but with an additional exterior 'Court of the Gentiles.' A new *stoa basilica* or three-aisled portico of vast dimensions occupied the south side of the inclosure; 'Solomon's porch' was re-erected in the form of a colonnade along the east front, in which was perhaps the 'Gate Beautiful' (Acts iii. 2). This temple was the one from which Christ expelled the money-changers and merchants. It was destroyed during the pillage of the city by Titus, A.D. 70, but contrary to his orders. Under Constantine an effort on the part of the Jews to rebuild it was severely punished, and a contemporary writer states that a later attempt by the Emperor Julian to rebuild it was frustrated by "flames which burst from the foundations." On the temple area, called by the Arabs *Haram-esh Sheri*, one of the early caliphs (probably Abd-el-Melek, who reigned from 685 to 705) erected a splendid mosque, the ***Kubbet-es-Sakhrah***, commonly known as the 'Mosque of Omar,' and the place has ever since remained in the possession of the Moslems.

All three temples must have presented an aspect of mixed architectural styles, due to the general lack of skill in the plastic arts among the Jews, and their consequent dependence on the arts of neighboring nations. Solomon's achievement was, under these circumstances, amazing in the grandeur of its general conception and the splendor of its gilding, decoration, and furniture. But it was far surpassed in scale and in magnificence of external architecture by Herod's temple.

THE TEMPLE SERVICE. The Solomonic temple was primarily intended to be a Yahweh-sanctuary, as is evident from I. Kings viii. 13. But during the period of the Davidic dynasty many other divinities were worshiped in it. (See e.g. Ezek. viii., II. Kings xviii., xx.) The temple of Zerubbabel appears to have been devoted solely to Yahweh. In B.C. 168 the sanctuary was dedicated to Zeus Olympius and remained a Zeus temple for three years (I. Macc. i. 54; iv. 52). The magnificent temple of Herod was until the fall of Jerusalem the great centre of the Jewish sacrificial cult, having no rival except Onias's Temple (q.v.) at Leontopolis, and was devoted exclusively to the imageless worship of Yahweh.

In the regal period the King was the chief priest officiating in the temple. Whether there was a ceremony corresponding to the 'seizing of the hands of Bel' by the Babylonian kings, cannot be determined. But the annual entrance into the Holy of Holies by the high priest of the Persian period may have developed out of such a custom. David set the example of appointing his own sons as priests (II. Sam. xviii. 8). There was no distinction yet between priests and Levites. Even in the Deuteronomic code, introduced about B.C. 620, the Levites are priests whose function it is to offer sacrifices. In the Persian period a high priest was at the head of the hierarchy; and only families claiming descent from Aaron were permitted to offer sacrifices. The Levites were a class by themselves and were not allowed to present the sacrifices, while musicians and doorkeepers formed a still lower class. The Levites as well as the priests were divided into twenty-four 'courses.' Next to the high priest ranked the *Segan*, or captain of the temple police, then came the heads of the twenty-four courses, and a large number of other officials. While in earlier times even the common people seem to have had access to the inner court, in later times the Levites and lower ministers were forbidden to enter it. Non-Israelites were not permitted to enter any part of the temple, but representatives of the people of Israel were required to attend in turn the daily offerings in the outer court.

The Tamid, or the daily offering, presented every morning and evening, was the most important of the many sacrifices of a public character. The number of sacrifices was increased on Sabbaths and festivals. The ceremony was preceded by lustrations and solemn choice of officiating priests. It consisted of the slaughter of the victim, the sprinkling of the blood on the altar, the removing of the blood from the altar of incense in the Holy Place, the trimming of the lamps on the candlesticks, the carrying of the different parts of the victim to the foot of the altar, the presentation of the flour-offering, the baked meal, and the libations of wine. During the celebration of this sacrificial service, the Shema Israel (Deut. vi. 4-9; xi. 13-21; and Num. xv. 37-41), the Ten Commandments, and three blessings were pronounced by the priests. The offering of incense was accompanied with prayer. Then the Levitic choir, to the accompaniment of stringed instruments, sang the psalm of the day, divided into three sections. At the end of each, priests blew three blasts on the silver trumpets, and the people prostrated themselves. This ritual goes back at least to Maccabean times, and the music and singing no doubt formed a part of the daily service long before sections of the present Psalter were in use. After the public sacrifice, private sacrifices began.

BIBLIOGRAPHY. The literature of the Temple is considerable. Among attempts to restore it one of the earliest is that of Villalpandus in Pradi's *In Ezechielum Explicationes* (1596). Of recent discussions and restorations we may mention Meyer, *Der Tempel Salomos* (Berlin, 1830); Canina, *Ricerche sull' architettura degli antichi Giudei* (Rome, 1845); De Vogüé, *Le temple de Jérusalem* (Paris, 1866); Edersheim, *The Temple, Its Ministry and Services in the Time of Christ* (London, 1874); Fergusson, *Temples of the Jews and Other Buildings on the Haram Area* (ib., 1874); Robins, article in *British Architect* (January, 1886); and the elaborate and superbly illustrated discussion of the first and second temples in Perrot and Chipiez, *Histoire de l'art en Judée*, etc. (Paris, 1889). The restoration of Zerubbabel's temple, by Chipiez, in this work, is a remarkable example of constructive archæology. See also Friedrich, *Tempel und Palast Salomos* (Innsbruck, 1887); Schmidt, *Solomon's Temple in the Light of Other Oriental Temples* (Chicago, 1902).

TEMPLE BAR. A noted gateway between Fleet Street and the Strand, London, built in 1670 by Wren, and marking the boundary of the City. Here the sovereign, on entering the City, was obliged to ask from the Lord Mayor permission to pass. The structure was removed in 1878 to make a way for the enormous traffic and its place was supplied by the memorial bearing statues of Queen Victoria and of Edward VII., then Prince of Wales.

TEMPLE CHURCH. The church connected with the former house of the Knights Templars in London, and the only portion of the original group of buildings remaining. It consists of a Norman Round church, 58 feet in diameter, dating from 1185, with a choir added in 1240. It has a richly painted ceiling and interesting tiled flooring, and contains nine monuments of Templars.

TEMPO (It., time). The degree of rapidity with which a piece of music is to be executed. The rhythmical proportions of notes, as indicated by their form, give them only a relative value, and have no reference to the absolute speed at which the entire composition is to be played. The varying rates of speed at which different compositions, or portions of compositions, are to be played is usually indicated by certain terms called *tempo marks.* These terms are not, however, always used with exact precision, and sometimes apply more to the character than to the absolute speed of performance. The following table gives the most usual tempo marks with their approximate significances:

SLOW	MODERATE	FAST
Largo	Andante	Animato
Grave	Moderato	Allegro
Lento molto	Allegretto	Vivace
Lento	Adagietto	Vivo
Larghetto	Allegro moderato	Allegro molto
Adagissimo	Sostenuto	Allegro vivo
Adagio	Commodo	Presto
Andantino	Non troppo allegro	Prestissimo
	Maestoso	
INDICATING RETARD		INDICATING ACCELERATION
Rallentamento		Accelerando
Rallentando		Stringendo
Ritardando		Affrettando
Largando		Veloce
Ritenuto		Ravvivando il Tempo
Tardando		Doppio movimento
Lentando		Sempre accelerando
Meno mosso		Più mosso

The tempo is indicated with far greater exactness by references to the beats of the metronome (q.v.). It is not, however, uncommon for composers to express the tempo by reference to some well-known musical form which has a characteristic movement, as 'tempo di marcia,' 'tempo di valse,' 'tempo di minuetto,' etc. Schumann and Wagner discarded the Italian nomenclature and indicated the tempo by means of German terms. In this they have been followed by a few other composers, but the German terms are not well enough known to be free from a certain vagueness. The Italian terms came into use at the beginning of the seventeenth century. Before that time the means of expressing the general speed at which a composition was to be played were very limited. In mensurable music (q.v.) each note had a certain average time value (integer valor); but in the course of years the unit of measure changed so frequently that great confusion ensued. In transcribing works of the sixteenth century in modern notation all notes must, as a rule, be reduced to about half their face values; while in still older works the reduction should be to a quarter or an eighth of the original value. *Tempo rubato* (stolen time) is the name given to a mode of performance to which a restless character is imparted by protracting one note beyond its proper duration, and curtailing another so that the aggregate duration of each measure remains unchanged. *Modification of tempo* is a term first used by Richard Wagner, in his article "Ueber das Dirigieren," to indicate that a composition cannot be played throughout in strict metronome time. This is especially true in dramatic music, and throws the responsibility for the interpretation of the music upon the conductor (q.v.).

TEMPORAL POWER (Lat. *temporalis*, relating to time, from *tempus*, time, season; connected with Icel. *þamb*, an out-stretching, Lith. *tempiù*, I extend) OF THE POPE. The sovereign power which the Pope possessed as ruler of the Papal States (q.v.), which, although modified in its exercise by his spiritual character, was in substance the same as that of any arbitrary sovereign. The question as to the necessity or utility of such a power vested in the hands of a spiritual ruler, and even of its lawfulness and its compatibility with his spiritual duties, has been very warmly debated. Many of the mediæval sectaries put forward the principle of the incompatibility of the spiritual with the temporal power in the same person, not only in relation to the Pope, but also as to the other ecclesiastics who were feudal lords. Such were the doctrines of the Vaudois, of Pierre de Bruys, and above all of Arnold of Brescia (qq.v.). Through the centuries which followed, the anti-Papal controversies turned so entirely upon doctrine that there was little room for the discussion of this question, and it is a mistake to suppose, as has not unfrequently been done, that it entered in any way into the conflict of Gallican and Ultramontane principles. Even the great Gallican champion Bossuet (q.v.) not only admitted the lawfulness of the Pope's temporal sovereignty, but contended that it was in some sense necessary to the free exercise of his spiritual power, and to the independence of his ecclesiastical government. It was not until the aggression of the French Republic upon Rome, and the annexation of the Papal provinces called the Legations to the Cisalpine Republic, and afterwards to the Kingdom of Italy, by Bonaparte, that the controversy assumed any practical interest. For a few years all of the Papal territories were in the hands of Napoleon. More recently, upon the incorporation of the whole of the Papal States in the Kingdom of Italy, the question once more agitated the entire Catholic world, and is still, a generation later, a practical one. Most Roman Catholics, while admitting that the possession of temporal sovereignty is no essential part of the privileges of the successor of Saint Peter, regard the possession of a sovereignty independent of any particular sovereign as the means providentially established for the protection of the spiritual independence of the Pope, and of the free exercise of his functions as spiritual ruler of the Church.

TEMRYUK, tyĕm-ryo͞ok′. A seaport in the Territory of Kuban, Ciscaucasia, Russia, situated on an inlet of the Sea of Azov, 90 miles west of Ekaterinodar (Map: Russia, E 5). It has an extensive export trade in grain and flour. Population, in 1897, 14,476.

TEMUCO, tȧ-mōōk′kō. The capital town of the province of Cautin, Chile, 140 miles southeast of the port of Concepcion, with which it has railway communication, on the north bank of the river Cautin (Map: Chile, C 11). The town has tanneries and breweries and carries on an important trade with the Arucanians of the vicinity. Its population in 1895 was 7078.

TENAILLE, tē-nāl′. See Fortification.

TENANCY AT SUFFERANCE (OF. *tenance*, from ML. *tenantia*, a holding, retaining, from Lat. *tenere*, to hold, retain; connected with Gk. *τείνειν*, *teinein*, Skt. *tan*, Goth. *uf-þanjan*, AS. *þenian*, OHG. *denen*, *dennen*, Ger. *dehnen*, to stretch out). A continued but wrongful occupation of land by a tenant whose original possession was with the consent of the owner, after his term has expired and without permission of the landlord. By the common law, the landlord may enter at any time and forcibly eject him, and he cannot maintain an action against the landlord for assault and battery, if the latter expels him from the premises without using unnecessary force or violence. He may be sued for use and occupation, but not for rent. See Tenancy at Will. Consult the authorities referred to under Landlord and Tenant.

TENANCY AT WILL. An occupation of land by a person under a demise or agreement with the landlord that the tenancy shall not be for a fixed term, but shall be determinable at the will or caprice of either party. By the common law, a tenant at will could not assign or convey his estate, and was obliged to pay rent only for the time he remained in actual occupation. A tenant at will is entitled to notice to quit, and in the absence of statute this notice should generally be given for a time equal to the period between two rent days, in advance of the date set for removal. Where such a tenant receives notice to quit and has growing crops at the time, he is entitled to enter later and gather them, and he must always be given a reasonable time in which to remove. See Tenancy at Sufferance.

TENANCY IN COMMON. See Common, Tenancy in; Joint Ownership.

TENANT FOR LIFE. See Life Estate.

TENANT RIGHT. In English law a custom which is recognized in some districts in Ireland, under which a tenant is conceded the right to continue to occupy land upon which he has made improvements, practically indefinitely without the payment of an increased rent. By the 'Land Act' of 1870 the custom was recognized. See Landlord and Tenant.

TENAS′SERIM. The southernmost division of Lower Burma (see Burma), bordering on Siam, and comprising the districts of Salwin, Amherst, Tavoy, Thaton, Toungu, and Mergui (Map: Burma, C 4). Tenasserim is a narrow strip of coast about 500 miles long, with a varying breadth of from 40 to 80 miles, extending from the Pakchan River northward to the Salwin. Area, 36,086 square miles. Population, in 1891, 912,051; in 1901, 1,137,776. The chief town is Maulmain.

TEN BRINK. See Brink.

TENCH (OF. *tenche*, Fr. *tanche*, from ML. *tenca*, Lat. *tinca*, tench). A small European cyprinoid carp-like fish (*Tinca vulgaris*), an inhabitant of ponds and stagnant waters. It is deep yellowish brown and usually about a foot long. Its flesh is poor. See Plate of Carps and Allies.

TENCIN, täN′säN′, Claudine Alexandrine Guérin de (1681-1749). A French novelist, prominent in the literary society of the Regency. She was born at Grenoble, and was placed in the Convent of Montfleury as a novice, whence a sympathetic Lothario rescued her from seclusion. She next appeared at Paris as an unscrupulous friend of Cardinal Dubois (1714), gathering about her a crowd of admirers, among them Fontenelle, Law, and the Regent. With the death of the Regent Orleans (1723) her influence waned. In 1726 she suffered a brief imprisonment in the Bastille because a desperate lover had killed himself in her house. Later her reputation revived; she became decorous and popular with the now also aging 'pets of the menagerie' of her youth, among them Duclos, Lamotte, Marivaux, Marmontel, Montesquieu. She wrote three novels, all mingling history with fiction: *Les mémoires du comte de Comminges* (1735); *Le siège de Calais* (1739); and *Les malheurs de l'amour* (1747), the last a bit of psychic autobiography. The strength of all these tales lies in their scenes of dread and gloom, some of which were then unrivaled in French fiction. Her nearest literary analogue is Madame de Lafayette (q.v.). Tencin was mother, through one of her many illicit connections, of D'Alembert (q.v.). Her correspondence with her brother, Cardinal de Tencin (1680-1758), appeared in Paris in 1780, that with the Duke de Richelieu in 1806. Alleged *Mémoires secrets* were published by Barthélemy (*Grenoble*, 1790). Tencin's *Œuvres*, with those of Madame de Fontaines, were published by Garnier (Paris, 1864).

TEN COMMANDMENTS. See Decalogue.

TENDA, tĕn′dȧ, Col di. A pass over the Maritime Alps in Italy near the French boundary, and 25 miles from the Mediterranean coast (Map: Italy, B 3). Its altitude is 6145 feet, and it carries the railroad from Cuneo to Ventimiglia. The carriage road from Cuneo to Nice passes here through a tunnel nearly two miles long and lighted by electricity.

TENDAI-SHU, tĕn-dī′shōō′ (Chin. *T'ien-tai Tsung*, name of a mountain in China where the founder of the sect studied). A sect of Japanese Buddhists, established toward the end of the eighth century by a Japanese priest named Dengyo Daishi. Like all Japanese sects, it is of the Northern School, and is based upon the *Saddharma Pundarika*, or 'Lotus of the Good Law.' Salvation lies in the perception of the original and absolute Buddha, of whom the historic Buddha is one manifestation. The means of salvation are meditation and wisdom. It has an exoteric teaching for the vulgar, while its esoteric doctrines are reserved for the monks, although the highest truths are recognized as transcending human comprehension. The sect is eclectic, and various Buddhas are worshiped in its temples. It completed the triumph of Buddhism in Japan by declaring that the Shinto deities are manifestations of Buddha. As it attempted in its teaching to reconcile contradictory doctrines, it gave rise to schism and became the mother of many sects. Its centre was on the mountain near Kyoto called Hiyei-zan. Its priests, though devoted by profession to meditation, became very warlike in the Middle Ages. Nobunaga (q.v.) in A.D. 1571 destroyed the monastery, and killed the inhabitants. The sect never regained its commanding position.

TENDENCY (from Lat. *tendens*, pres. part of *tendere*, to stretch, tend; connected with Gk. *τείνειν*, *teinein*, Skt. *tan*, to stretch, OHG. *dunni*, Ger. *dünn*, AS. *þynne*, Eng. *thin*). A term in psycho-physics denoting the nervous disposition which underlies mental constitution. It may be termed 'psycho-physical tendency' if attention is to be directed to the trend of consciousness which is given by a peculiarity of organic structure, or 'mental tendency' if emphasis is to be laid on the fact that different minds are attracted by different sources of stimulation and persist in reacting differently to like stimuli.

Tendencies are either natural or acquired. (1) Natural tendencies are based on inheritance and are transmitted through the medium of the nervous system, which tends to discharge by preference in a certain direction. (2) Acquired tendencies are permanent impressions, 'sets' which are given the nervous system, especially while it is plastic. Such a tendency exists as a liability to discharge through certain channels which form lines of least resistance under stimulation. A habit started quite incidentally or even in the face of constitutional reluctance may become in time a distinctly 'ingrained' tendency toward a particular action or mode of thought. (See MENTAL CONSTITUTION; DISPOSITION; MEMORY; TEMPERAMENT; and HABIT.) W. James speaks of 'feelings of tendency' when a meaning is adumbrated but not fully realized, in the state of expectant attention. See ATTENTION and SUBCONSCIOUSNESS.

TENDER (from ME. *tender*, OF., Fr. *tendre*, from Lat. *tendere*, to stretch, extend; connected with Gk. *τείνειν*, *teinein*, Skt. *tan*, Goth. *uf-þanjan*, AS. *þenian*, OHG. *denen*, *dennen*, Ger. *dehnen*, to stretch out). As a legal term, the formal offer to perform some legal obligation incumbent on the person tendering performance under such circumstances as to make no further act necessary from the party making the tender. The term is most frequently used with reference to the payment of money due, but it is not limited to that application. If the obligation is simply to pay money, all that the debtor is required to do is to plead that he duly tendered the money; and if he pay into court the sum formerly tendered, the other party must discontinue the action or proceed with it at his own risk. See MORTGAGE; PLEDGE.

In some States the rule that a tender must be made in lawful money has been relaxed and a tender made by a check or bill of exchange is good unless the debtor rejects the tender on the ground that negotiable paper is tendered instead of lawful money. The creditor may also dispense with the necessity of tender on the part of the debtor by preventing a tender. In many States there are statutory provisions permitting a debtor in case action is brought against him by the creditor, to pay the sum due into court, or to offer to permit the creditor to take judgment for the amount due, the effect being, as in case of tender, to stop the running of interest and to prevent the creditor from recovering further costs.

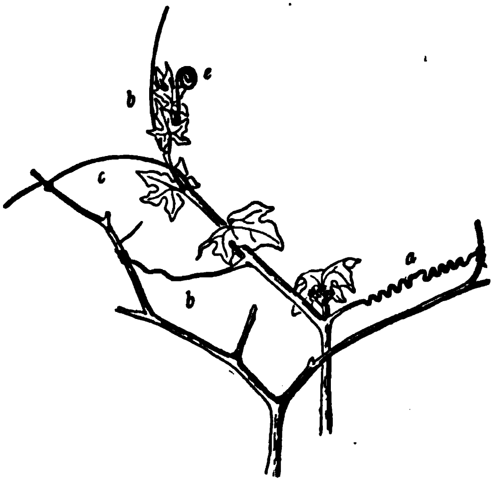
United States notes issued under act of Congress of 1862 are legal tender for all public and private dues except duties on imports and interest on the public debt. Those issued under act of July 14th, 1890, are legal tender in payment of public and private debts. Gold and silver certificates of the United States are legal tender under the same condition as gold and silver coinage respectively. Notes issued for circulation by national banks are legal tender in payment of all debts and dues, public or private, except duties due the United States on imports, and interest on the public debt and in payment upon redemption of the national currency. They are generally not legal tender for any debt due any national banking association. See LEGAL TENDER.

TENDON (from ML. *tendo*, tendon, from Lat. *tendere*, to stretch, extend). A term employed in anatomy to designate the structure of white fibrous tissue reaching from the end of a muscle to bone or some other structure which is to serve as a fixed attachment for it, or which it is intended to move. In accordance with their form, tendons have been divided into the three following varieties: (1) *Funicular*, or rope-like, as the long tendon of the biceps muscle of the arm; (2) *fascicular*, as the short tendon of that muscle, and as most tendons generally; and (3) *aponeurotic*, or tendinous expansions, sometimes of considerable extent, and serviceable in strengthening the walls of cavities, as, for example, the tendons of the abdominal muscles.

The tendons begin by separate fasciculi from the end of each muscular fibre, and they similarly terminate by separate fasciculi in distinct depressions in the bones besides being closely incorporated with the periosteum. Tendons, together with their sheaths, are subject to acute and chronic inflammations and to tumor formation. The ordinary acute form of inflammation known as *acute teno-synovitis* is usually brought along by injury such as a blow or by over-use. The chronic form of inflammation is usually tubercular, though a rheumatic diathesis sometimes occurs. The tumors usually observed in tendons are small fibres and cartilaginous enlargements. Such growths occasionally assume malignant character. When separation of a tendon occurs either by rupture or incision, if the ends of the divided tendon are not too widely separated, repair takes place by the deposition of new fibrous tissue, closely resembling true tendon tissue. This repair is usually complete at the end of three weeks.

TENDRIL (Fr. *tendrille*, from *tendre*, tender, from Lat. *tener*, delicate; connected with *tenuis*, Gk. *ταναός*, *tanaos*, Skt. *tanu*, OHG. *dunni*, Ger. *dünn*, AS. *þynne*, Eng. *thin*). A slender, usually cylindrical organ of higher plants used for climbing. As to their origin, tendrils may occupy the position of leaflets, or of leaves, normally subtended by branches, or of branches usually subtended by leaves. The last two sorts, however, are not always easily distinguished. Some tendrils are coiled when young, unrolling as they mature; others are merely bent, or straight, or variously folded. At maturity they are usually slightly hooked near the apex.

Structurally, tendrils contain vascular bundles, surrounded by a cortex of thin walled and somewhat elongated parenchyma cells, covered by a delicate epidermis. (See HISTOLOGY.) Physiologically, they are sensitive to friction, often remarkably. Sensitiveness is ordinarily greatest on the concave side of the curved tip, though some tendrils are more sensitive on the flanks and others equally sensitive on all sides. Tendrils of Cyclanthera under favorable conditions will respond to a stimulus in less than ten seconds, those of Passiflora in about 30 seconds, while those of some other plants may only respond after 30 to 90 minutes. The response consists in a curvature of the tip. This is first due to the shortening of cells on the concave side and the lengthening of those on the convex side. This temporary curvature is maintained by the accelerated growth of the convex side, so that the part of the tip beyond the object with which it has come into contact is coiled around the support, provided this be of sufficiently small diameter. If large and rough the tip may be appressed to the surface, growing closely into the irregularities, and so adhere more or less firmly in that way. The petioles of some leaves, e.g. Clematis, show a similar but less acute sensitiveness to friction, making one turn about a support. Uncaria has short conical hooks which are stimulated by contact and friction to grow in such a way that they enlarge greatly and curve about a support. After a tendril has laid hold of an appropriate support the portion between the support and the axis of the plant is brought under strain, to which it responds by unequal growth on one side. By this means it is thrown into a spiral with one or more points of reversal (a mechanical necessity when a once straight cylindrical body elongates on one side and so coils up). The coils develop mechanical tissues, and the most perfect tendril thus becomes a strong, uniformly coiled, elastic spiral spring which supports the plant. See LIANAS.



TENDRILS OF BRYONY.

a, a tendril that has attached itself and is coiling, with reversal of coils in centre; b, a recently attached tendril, the unequal growth just beginning; c, one just attached; d, one just straightened out; e, one still coiled from the bud.

TENEBRÆ (Lat., darkness). A service in the Roman Catholic Church; the matins of Thursday, Friday, and Saturday in Holy Week, generally sung on the preceding evening. The name is taken from the opening of the Responsorium following the fifth lesson on Good Friday, *Tenebræ factæ sunt.* The service consists of sixteen Psalms and a Canticle from the Old Testament, sung with their proper Antiphons in fourteen divisions, nine Lessons, nine Responsories, the Canticle *Benedictus*, and the *Miserere.* Most of the service is in unisonous plain chant. At the conclusion of each Psalm and Antiphon one of the fifteen candles in the triangular candlestick used for this special service is extinguished with ceremony. During the singing of the *Benedictus* the six altar candles are put out one by one. The only light remaining is the candle at the apex of the candlestick. This is removed and carried behind the altar. After the singing of the Antiphon, *Christus factus est pro nobis obediens usque ad mortem*, a silence follows, during which the *Paternoster* is whispered in secret; after the *Miserere*, a prayer is made and the candle is brought from behind the altar. Then, according to the rubric, "all rise and depart in silence."

TEN'EDOS. An island in the Ægean Sea, situated five miles from the northwestern coast of Asia Minor, near the entrance of the Dardanelles (Map: Greece, G 2). Area, 16 square miles. The only town which bears the name of the island is inclosed by walls and has an old castle and remains of the storehouses erected by Justinian. The surface of the island is uneven and rocky, but the soil is fairly fertile. Wine is the most important product, about 5,000,000 gallons being annually exported. Population, about 4000, one-third of whom are Mohammedans. Originally settled by Æolians, Tenedos was successively under the control of Persia, Athens, Rome, the Byzantine emperors, and Venice. Since 1322 it has been a Turkish possession, and is included in the Archipelago Vilayet.

TENEMENT (Lat. *tenementum*, a holding, fief, from *tenere*, to hold, retain). In the strict legal sense, anything of a permanent nature, corporeal or incorporeal, which may be held or be an object of tenure (q.v.). The term is now used in a very broad sense and denotes any estate or interest in lands. The word is also popularly used to denote a rented house, especially one which is occupied by several families. See REAL PROPERTY.

TENEMENT HOUSE PROBLEM. The problem of the making possible a healthful human existence under the conditions of dense population in our modern cities. With the growth of great cities, a double movement of population takes place. The well-to-do are driven from former residential districts by the encroachments of business, while working people crowd into their vacated houses. Rear tenements are built behind the old houses; new structures are put up solely for use as tenements; and the whole process is left in the hands of private builders and landlords, ill-regulated by the municipality, until its two most obvious evils, the danger from epidemics and the danger from fire, force themselves upon public attention.

The fundamental evil of the tenement is crowding under unsanitary conditions. Houses built for one family cannot be adapted to hold four or more, sanitary conveniences become increasingly inadequate, needed repairs are not made, the tenants deteriorate, and the slum is formed. A district built up fully with new tenements and more crowded than the slum may be less degraded, but is hardly more wholesome. A high death-rate, especially among infants, is a normal characteristic of tenement districts. In New York in 1894 the general death-rate for the city was 22.75, but it was as high as 33 in some crowded wards. Jewish quarters, densely populated as they are, are exceptional in usually having a death-rate below that for the whole city. In certain rear tenements in New York the death-rate for children under five years has been at times over 200 per 1000.

The personal and social evils of tenement life are more far-reaching than the physical. See **HOUSING PROBLEM.**

A first step in reform is legislation compelling the destruction or renovation of existing dwellings that are unsanitary, but it is equally important to provide for rehousing the displaced population, and to see that new tenements are properly built. The British act of 1890 permits municipal condemnation of unsanitary areas, but requires that all persons displaced shall be rehoused on or near the same site. Ordinary laborers must live near their work, or in the central area of the city, and it is thought a mistake to build in such areas model tenements at a cost requiring rents that only the skilled artisan can pay. To house the artisan in the outer belts, the clerk and similarly paid workers in the suburbs, and to provide quick and cheap transportation, is the effective mode of attacking the housing problem. Such a process is necessarily slow. So long as old houses stand, and new ones are put up for private profit, a good sanitary and building code is essential, but with it should be provided, as has not usually been done in American cities, a proper force for inspection and enforcement. Private initiative has proved that model tenements can be commercially successful in housing either artisans or more poorly paid laborers. As the more obvious evils of over-crowding, malconstruction, and insanitation are corrected, the purely social aspects of the problem are attacked more and more directly, both by the municipality itself and by private philanthropy. In Great Britain housing improvements on a large scale have been undertaken by the municipalities. Private companies also have been active. The Housing of the Working Classes Act (1890), consolidating and improving a series of laws reaching back to 1851, permits cities to condemn and acquire economically areas adjudged unsanitary, and to erect and manage new dwellings on the premises. Under this act London spent $1,400,000 in clearing 15 acres of one of its worst slums in Bethnal Green, laid out the area attractively, and rehoused upon the same site practically all the 5700 people displaced. The County Council later undertook other schemes involving the housing of 25,000 persons, and in accordance with the amendment of 1900 began to build workmen's cottages outside the county limits. Several large private foundations, such as the Peabody Fund, have built and successfully run model tenements on a large scale.

In Continental Europe construction of tenements by the city is less common than in England, but general sanitary reform has been very marked. In Berlin, where over 99 per cent. of the population live in apartments or tenements, the chief activity centres in efficient sanitary measures and the removal of congestion through rapid transit and supervision of the suburbs. In many German towns, and in Belgium, Holland, Scandinavia, and France, municipal effort has gone along similar lines, while many model tenements have been built by private societies. In Paris sanitary conditions are carefully supervised, and questionable tenements are in the hands of a special commission.

Conditions differ widely in the large cities of the United States. Most have slum districts; not many, as yet, have developed a serious tenement house problem. Chicago's rapid and ill-regulated growth has given her several deplorable areas, with a great number of old, neglected and unsanitary houses. Jersey City has some of the worst tenement districts in the country. In Boston conditions are similar to those of New York, where the tenement problem has long been pressing, and, owing to the confined land space of Manhattan Island, is unique in difficulty. The Board of Health was roused to criticise housing conditions as early as 1834, and after 1843, when the Association for Improving the Condition of the Poor was founded, the matter was frequently brought to public notice. A legislative inquiry in 1856 and an investigation by the Council of Hygiene in 1864 led to the first tenement-house ordinance in 1867. New York has long had a model sanitary code, but provision for enforcement has been wholly insufficient for this, as with its tenement laws. Up to 1879, the date of the next revival of public interest, tenement dwellings in New York were modified private houses or rear tenements built behind such, or buildings put up solely for tenement purposes, covering 75 to 90 per cent. of the lot's area. In 1879 appeared the typical New York tenement, the 'double-decker' or 'dumb-bell.' Built five stories high on a lot 25 feet wide, it covers from 86 to 90 per cent. of the lot's depth, and 75 per cent. of its area, with 14 rooms, for four families, on each floor. Its typical feature is the laterally indented air shaft, usually 28 inches wide in the widest part, or 56 inches when two similar houses are together. All rooms except the four outside ones open upon this shaft, which gives little daylight and no ventilation below the fourth story, is the source of greatest danger during fires, and has been described, hygienically, as a 'culture tube on a large scale.' Under such conditions perhaps a million New Yorkers live.

The commissions of 1884 and 1894 improved the tenement laws in various points, but little progress was made in enforcement. Model tenements, beginning with the 'Riverside' dwellings in Brooklyn, erected by Alfred T. White in 1876, have been built in many places in New York City, notably by the City and Suburban Homes Company (founded 1896). These undertakings have been commercially successful, paying dividends of 4 to 7 per cent. No American city has followed the English policy of building tenements on its own account, but the plan of condemning property for small parks has found favor. New York spends at least $1,000,000 yearly in this way. It thus abolished its worst slum, at Mulberry Bend, and—one example among several—

in 1903 it opened 2½ acres between Hester and Division streets, with playgrounds and public conveniences in the heart of one of the most crowded areas in the world. The results of the work done by the Tenement House Commission of 1900 have been substantial. Under the new law, new tenements may not cover more than 70 per cent. of the lot's area, and discretionary power to mitigate this restriction has been taken from the Building Department. The old form of air shaft is no longer legal in new tenements, open courts being required instead. Encouragement is given to tenement building on wider units than the 25-foot lot; provisions for sanitation and for protection against fire are improved, and, above all, a special Tenement House Department has been created to enforce the law concerning old houses as well as new. New York's transit question is yet far from solved, but progress is making. Tremendous as the city's tenement problem is, the outlook for the near future is encouraging.

BIBLIOGRAPHY. United States Commissioner of Labor, *Eighth Special Report* ("The Housing of the Working People") (1895); *Seventh Special Report* ("The Slums of Great Cities") (1894); Shaw, *Municipal Government in Great Britain* (New York, 1895); id., *Municipal Government in Continental Europe* (ib., 1895); Raffalovich, *Le logement de l'ouvrier* (Paris, 1887); Reynolds, "Housing of the Poor in American Cities," *American Economic Association* (1893); Riis, *How the Other Half Lives* (New York, 1890); id., *A Ten Years' War* (ib., 1899); *Reports* of New York's Tenement Commissions of 1884, 1894, and 1900; Veiller, *Tenement Reform in New York* (New York, 1900); Hunter, *Tenement Conditions in Chicago* (Chicago, 1901); Masterman and others, *The Heart of the Empire* (London, 1902); De Forest and others, *Housing Problems*, American Academy of Political and Social Science Publications (Philadelphia, 1902).

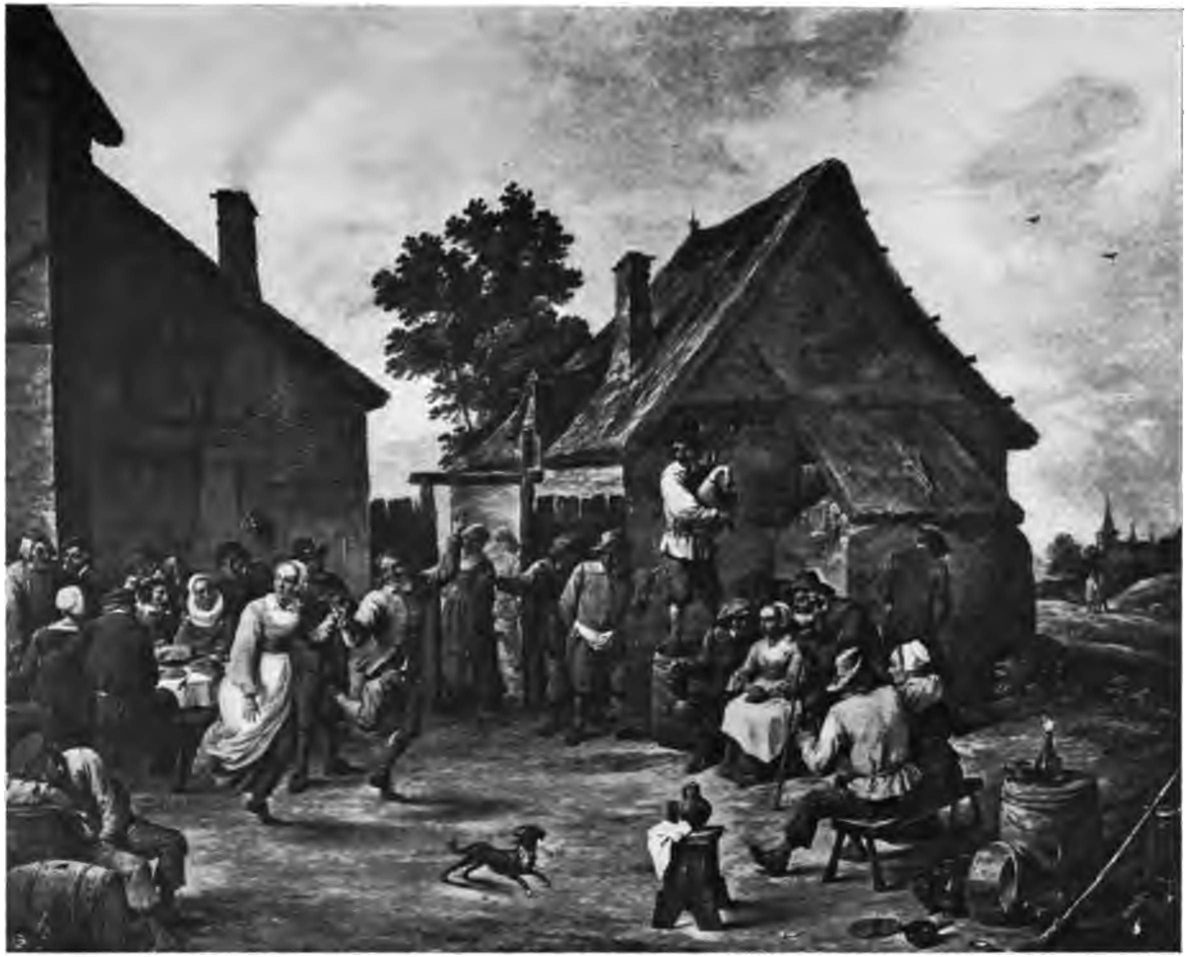
TENERANI, tā'nā-rä'nē, PIETRO (1789-1869). An Italian sculptor, born at Torano, near Carrara. He was a pupil of Canova and later of Thorwaldsen, to whom he became a favorite assistant. He resided almost altogether at Rome, was professor in the Academy of San Luca, and held the post of director of all the museums and galleries of that city. His works are fair and soft in form, and smooth in execution. His "Psyche and Pandora's Box," in the Palazzo Lenzoni, Florence; a large relief of the "Deposition from the Cross," in the Lateran; an "Angel of the Resurrection," in Santa Maria sopra Minerva; and the tomb of Pius VIII. in Saint Peter's are among the best of his sculptures. Other specimens are to be found in many Italian churches and cemeteries. He executed a statue of Bolivar for Colombia, South America.

TEN'ERIFFE' (Sp. *Tenerife*). The largest of the Canary Islands (q.v.), situated a little west of the centre of the group, between the islands of Palma and Gran Canaria (Map: Spain, F 5). Area, 782 square miles. It consists of a nearly circular main portion from which a peninsula projects toward the northeast. The latter consists of ancient, much eroded, and forest-covered mountains, while the main portion rises into the magnificent Peak of Teneriffe or Pico de Teyde, a dormant volcano 12,192 feet high. The base of this enormous cone consists of pasture land interspersed with forests of chestnut and oak, but the upper slopes, which are steep and difficult of ascent, are covered with volcanic scoriæ, while the summit is capped with snow in winter. The last serious eruption of the volcano occurred in 1704. The climate is mild and healthful, and dates, cocoanuts, and other tropical and northern fruits are cultivated, as well as grain, cotton, sugar, and grapes. Population, in 1887, 109,417; in 1900, 137,302. The capital of the island, as well as of the whole archipelago, is Santa Cruz de Tenerife (q.v.).

TENES'MUS (Neo-Lat., from Lat. *tenesmos*, from Gk. *τεινεσμός*, *teinesmos*, a straining at stool, from *τείνειν*, *teinein*, to stretch, strain). Pain referred to the rectum or bladder, due to the spasmodic contraction of the sphincter ani or sphincter vesicæ, and associated with an unsuccessful desire to evacuate the bowels or bladder. Rectal tenesmus is a constant symptom of dysentery (q.v.), and may accompany hemorrhoids, fissure, fistula, or malignant disease of the lower part of the rectum. Causes of vesical tenesmus are chiefly cystitis (q.v.) and pressure on the bladder. Treatment will depend on the disease of which tenesmus is a symptom, but cold or hot applications, enemas containing laudanum, or suppositories of opium, cocaine, belladonna, or hyoscyamus will relieve the pain.

TENIERS, te-nērz', *Fr. pron.* te-nyā', DAVID, the Elder (1582-1649). A Flemish genre and landscape painter, born at Antwerp, pupil of his brother Julian (1572-1615). He studied under Rubens and in Rome was influenced by Elsheimer, in whose manner he painted landscapes with mythological figures, eight of which are preserved in the Vienna Museum. Afterwards he turned to fantastic subjects and rustic genre scenes in the prevailing taste of the times, such as the "Temptation of Saint Anthony" (Berlin Museum), "Peasants Carousing in Front of a Tavern" (Darmstadt Gallery), and "A Dutch Kitchen" (Metropolitan Museum, New York).

TENIERS, DAVID, the Younger (1610-90). The principal genre painter of the Flemish school, born at Antwerp, son and pupil of the preceding. Before he was twenty his work bore the stamp of maturity, and in 1633 he entered the guild as master. His early manner and choice of subjects is represented by such examples as "The Prodigal Son" (Pinakothek, Munich), "The Five Senses" (Brussels Museum), "A Merry Repast" (Berlin Museum), and "The Misers" (1634, National Gallery, London). The delineations from peasant life, which henceforth constituted the keynote of his productions, showed the influence of Adrian Brouwer. Of more than 100 such pictures which Teniers painted, some of the most characteristic are: the "Interior of Village Inn," "Flemish Tap-Room" (1643); "Peasants' Dance" (1645); "The Smokers" (1650, all in the Pinakothek, Munich); "Hour of Rest" (Amsterdam), "Smoking Club" (Dresden), and "Backgammon Players" (1641, Berlin). Brouwer's spirit also prevails in subjects like "The Dentist" and "The Barber Shop" (both in Cassel), "The Village Doctor" (Brussels), and "The Bagpipe-Player" (Buckingham Palace, London); also in various treatments of "The Alchemist" (The Hague and Dresden), and



DAVID TENIERS—THE RUSTIC WEDDING

FROM THE PAINTING IN THE PINAKOTHEK, MUNICH

of the "Temptation of Saint Anthony" (Brussels, Dresden, and—dated 1647—Berlin).

In 1637 Teniers married Anna Breughel, the daughter of Jan Breughel and ward of Rubens, who was one of the marriage witnesses. Soon after the death of Brouwer in 1638 the influence of Rubens became apparent in Teniers's coloring, which changed from a general brownish tint to a warm golden tone with rich and luminous local colors, and in the dramatic life animating his large compositions, extremely rich in figures. This phase is well exemplified by a "Peasants' Dance" (1640, Berlin), and the "Flemish Kirmess" (1641, Dresden, Vienna, Madrid, 1652, Brussels and Amsterdam). Especially remarkable for the number of figures is "The Great Fair in Florence" (Munich), and interesting portrait groups are represented in "The Artist and His Family" (c.1645, Berlin), and "Teniers in Front of His Castle Near Perck" (National Gallery, London). In 1642 he was commissioned to paint for Saint George's Guild an "Archers' Festival" (now in the Hermitage, Saint Petersburg), containing 45 characteristic portrait figures. A few scenes from military life are depicted in the splendid "Guard Room" (1641, Amsterdam), "Robbers Plundering a Village" (1648, Vienna), and "Relief of Valenciennes by the Spaniards" (Antwerp). Among several biblical episodes, the most attractive is "Abraham's Sacrifice" (1653, Vienna).

After Teniers had, about 1643, become lord of the manor of Dry Toren (Three Towers), near Brussels, he seems to have been more than ever absorbed in rural life and work; witness such productions of his brush as "The Sausage-Maker," "Cow-Stable," and "Goat-House" (all in Vienna), the last two especially noteworthy for their fine chiaroscuro. In 1650 the artist was appointed Court painter to Archduke Leopold William, and removed to Brussels, where he superintended that art-loving Prince's picture gallery and depicted notable events in his life and that of his consort, Isabella. The most interesting of these pictures is "The Shooting Match at Brussels, 1652" (Vienna), containing more than 470 figures. As director of the gallery he painted a series of interiors, faithfully representing its contents to the minutest detail. Of these there are four in Munich, and one each in Vienna (1656), Madrid, and Brussels (1657), the last being characteristic of the delicate silvery tone which prevailed in the painter's coloring for about a decade from 1650 on. Among the works of his later period are rural scenes and landscapes, besides his inimitable parodistic monkey-pictures, notably "Monkeys in a Tavern Smoking," "Repast in the Kitchen," and "Monkey Concert," all in the Pinakothek, Munich. Unique among his works is the "Sacrament of the Miracle of Saint Gudule" (Berlin), painted on white marble, the grain of which is visible through the colors. The Metropolitan Museum, New York, possesses a "Marriage Festival" and a "Temptation of Saint Anthony."

Teniers left about 800 paintings, which in searching observation of nature, wondrous harmony of color, and their whole artistic combination entitle their author to undisputed supremacy in his sphere. Consult: Rosenberg, *Teniers der Jüngere* (Leipzig, 1895); Wurzbach, in Dohme, *Kunst und Künstler*, i. (ib., 1877).

TENIM′BER. A group of islands in the Malay Archipelago. See Timorlaut.

TENINO, tä-nĕ′nō. A tribe of Shahaptian stock (q.v.) formerly claiming most of the Deschutes River country of northern Oregon, and now gathered with other tribes upon Warmspring reservation in the same region. They originally lived farther to the northeast, upon the Columbia. In 1855 they made their first treaty with the Government, and agreed to come upon their present reservation. Their language is also that of several smaller tribes formerly occupying both banks of the Columbia.

TEN KATE. See Kate.

TEN′NANT, William (1784-1848). A Scottish poet. He was born at Anstruther, Fifeshire, Scotland. A cripple almost from his birth, he naturally turned to study. In 1799 he entered the University of Saint Andrews, which he left after two years to become clerk to his brother, a corn-agent. The business proving unsuccessful, he was glad to accept in 1813 the situation of parish schoolmaster at Dunino, a small village about four miles from Saint Andrews, with a salary of £40 a year. In 1812 he had published his *Anster Fair*, a poem of much sprightliness and humor. The piece gradually made its way, aided by a highly laudatory notice in the *Edinburgh Review*, from the pen of the then omnipotent Jeffrey. In 1816 Tennant became teacher of a school at Lasswade, near Edinburgh, whence three years afterwards he was transferred to the Dollar Academy in Clackmannanshire. His attainments as a linguist were by this time extraordinary. In 1834 he was appointed professor of Oriental languages in the University of Saint Andrews. In connection with his new duties, he published a *Syriac and Chaldee Grammar* (1840). He died at Devon Grove, October 14, 1848. Besides other miscellanies in verse, Tennant published: *The Thane of Fife, a Poem* (1822); *Cardinal Beaton, a Tragedy* (1823); and *John Baliol, a Drama* (1825). None of these later productions increased the literary reputation which his first work had won for him. Consult Conolly, *Life of William Tennant* (Edinburgh, 1861).

TEN′NENT, Gilbert (1703-64). A Presbyterian minister. He was born in County Armagh, Ireland; came to America with his father, William Tennent, in 1718, and aided him as a teacher in the 'Long College.' He studied medicine and theology; was ordained pastor of a Presbyterian church in New Brunswick, N. J., in 1726, continuing the connection until 1743, though traveling and preaching with Whitefield in New England for several months; founded and became pastor of a church in Philadelphia, with which he remained connected until his death. In 1753 he visited England with President Davies to obtain aid for the College of New Jersey and raised £1500. He published many sermons.

TENNENT, Sir James Emerson (1804-69). A British traveler, politician, and author, born at Belfast, Ireland. He traveled through the Levant and Greece in 1824-25, and was a member of Parliament from 1832 to 1845. In 1842 he secured the passage of the bill granting copyrights to designers. He was secretary to the India Board (1841-43); civil secretary to the Ceylon colonial Government (1845-50); and shortly after his return to England, again entered Parliament (1852). There he was successively secretary for the Poor Law Board (1852), and a joint secretary of the Board of Trade (1852-67). After resigning the latter post, he was made a baronet. Under his original name of Emerson, to which he had added his wife's name, Tennent, Sir James published a number of books, including: *A Picture of Greece in 1825* (1826); *Christianity in Ceylon* (1850); *Ceylon: An Account of the Island* (2 vols., 1859); *Sketches of the Natural History of Ceylon* (1861); and *The Story of the Guns* (1865).

TENNESSEE′. A South Central State of the United States, popularly called 'The Volunteer State.' It lies between latitudes 35° and 36° 36′ N., and between longitudes 81° 37′ and 90° 28′ W., and is bounded on the north by Kentucky and Virginia, on the east by North Carolina, on the south by Georgia, Alabama, and Mississippi, and on the west by Arkansas and Missouri. The western boundary is formed by the Mississippi River, the eastern by the crest of the Unaka Mountains, while the southern boundary is a straight line. Tennessee has an extreme length from east to west of 432 miles, and an extreme breadth of 109 miles. Its area is 42,050 square miles, giving it the thirty-first rank in size among the States.

TOPOGRAPHY. The surface features fall into eight natural and well-marked topographical regions. The easternmost is the Unaka or Great Smoky Mountains, forming a belt of bold ridges. The average elevation of the main ridge is nearly 5000 feet, but a number of peaks within the State rise above 6000 feet, and Mount Guyot has an altitude of 6636 feet. Along the western base of the mountains stretches the Eastern Valley of the Tennessee, forming a succession of almost unbroken parallel minor ridges and valleys with an average elevation of 1000 feet. The valley is bounded on the west by the abrupt and rugged escarpment of the Cumberland Plateau. This is a nearly level table-land, rising about 1000 feet above the East Tennessee Valley, and falling on the western edge in a somewhat less rugged slope to a lower plateau known as the Highland Rim. This occupies the central portion of the State as far west as the north course of the Tennessee River, with an altitude of nearly 1000 feet. As its name implies, it forms a rim encircling the Central Basin, a large oval depression lying several hundred feet below the surrounding highland. The Highland Rim, though generally level, is cut by deep river valleys, and it is separated by the narrow Western Valley of the Tennessee from the Western Plateau Slope. The latter slopes gradually toward the Mississippi River, near which it ends abruptly in a line of bluffs bounding the Mississippi Flood Plain, a low and almost unreclaimed region covered by large lagoons and heavily forested cypress swamps.

HYDROGRAPHY. Tennessee belongs wholly to the Mississippi Valley, and its western quarter is drained directly into the Mississippi through a number of streams, the largest of which are the Obion and the Big Hatchie. The remainder of the State is drained by the two great tributaries of the Ohio, the Cumberland and the Tennessee. Both enter the State across the northern boundary in the east, and both leave it over the northern boundary in the west after making a large semicircular curve in which the Tennessee passes beyond the southern State limits. Both of them are large, navigable waterways, and the Tennessee has, besides, a number of navigable headstreams within the State, such as the Clinch, the French Broad, the Holston, and the Hiawassee. There are no lakes except the lagoons and cut-offs in the Mississippi bottomland. The largest of the lagoons is Reelfoot Lake, 25 miles long and 5 miles broad.

CLIMATE. The climate is in general mild, equable, and, except in the western lowlands, remarkably healthful and pleasant. The mean temperature varies but slightly in the different sections of the State, being scarcely two degrees lower in the east than in the west, excepting, of course, on the high mountains in the extreme east. For July the mean temperature is 77°, and for January 38°. The maximum may reach 104°, but the minimum is seldom lower than 10°, though it occasionally falls below zero in the mountains. The rainfall is also nearly equally distributed both as to seasons and localities, being somewhat heavier in the spring than in the autumn and heavier in the middle section than in the east and west. The normal average for the eastern section is 47 inches, for the middle section 52 inches, and for the west 50 inches, while the highest and lowest normals are respectively 61 and 42 inches.

SOIL. There is great diversity in the soils of the State, depending on the character of the rock formations, whose outcrops are coincident with the topographical regions. The alluvium of the Mississippi bottoms is the richest soil. It is followed beyond the bluffs by a brown loam becoming sandy and barren toward the Tennessee River. The Highland Rim has a siliceous soil of indifferent quality, but the Central Basin has a very fertile calcareous soil. The Cumberland Plateau is sandy and unproductive, but good magnesian limestone soil again occurs in the East Tennessee Valley.

FLORA. Numerous species of oak, as well as beech, hickory, walnut, locust, the tulip tree (*Liriodendron tulipifera*), and persimmon, are common throughout the State. On the mountains the pine, hemlock, sugar maple, and ash are abundant, though pine also grows in the sandy belt of the western plateau. Red cedar is especially common in the Central Basin, and in the swampy lowlands of the west are found the cypress, larch, swamp cedar, and papaw. Tennessee still has a very large forest area, chiefly distributed over the extreme eastern and western sections and in the southwestern and northeastern parts of the middle section.

For FAUNA see under the UNITED STATES.

GEOLOGY AND MINERALS. The outcrops of the geological formations of Tennessee correspond with the topographical regions described above. In the western three-fourths of the State the strata lie nearly horizontal and undisturbed, and the Central Basin and Cumberland Plateau are formed by the wearing away in the one case of the overlying, and in the second case of the surrounding portions of the strata. East of the Cumberland Plateau the strata are upturned so that their exposed edges form the ridges of the East Tennessee Valley and the mountain ranges. The great eastern Archæan area comes but slightly within the State limits in the extreme east. The Unaka Mountains are mostly of the Ocoee formation of the Cambrian system. The minor ridges and depressions of the East Tennessee Valley consist of successive outcrops of Potsdam sandstone of the Cambrian, and Trenton limestone, shales, and dolomite belonging to the Lower Silurian age. The Lower Silurian strata pass under the Cumberland Plateau and Highland Rim, and reappear as the surface rock of the Central Basin, and again in the bottom of the Western Tennessee Valley. The plateau strata are Carboniferous, the Highland Rim being Sub-Carboniferous, while the Cumberland Plateau belongs to the Upper Carboniferous system. West of the Western Tennessee the Paleozoic strata disappear, and on their edges the Cretaceous and Tertiary strata rest unconformably. The Cretaceous outcrop is narrow, the greater part of the Western Plateau Slope being Tertiary. Between the bluffs and the Mississippi River the surface is of recent alluvial formation.

There are two great iron belts in the State, one occupying the western part of the Highland Rim, and the other stretching along the western slope of the Unaka Mountains. The ore is chiefly limonite, with some magnetite in the northeast. Copper occurs in the metamorphic rocks in the extreme southeastern corner of the State, and zinc and lead are found in various parts of the East Tennessee Valley. The coal measures of the Cumberland Plateau contain several seams of bituminous coal of workable thickness. Other minerals of importance are hydraulic limestone and marble of a good quality, as well as other building stones derived chiefly from the Silurian strata.

Mining. Tennessee is beginning to acquire considerable importance as a mining State. Coal is excavated in the mountain counties west of the Upper Tennessee River. For several years prior to 1899 the annual value of the coal output was about $2,300,000; subsequently it rose until in 1901 it was valued at $4,067,381, the amount being 3,633,290 short tons. Over 9000 men are employed. There were 404,017 short tons of coke manufactured in that year. The iron ore mined in 1901, 789,494 long tons, was an increase over former years and made the State sixth in rank. Of the total amount, 474,545 tons was brown hematite. The mining of phosphate rock began in 1894 and the output of 1901 was worth $1,192,090, which was less than in the previous year. The marble quarried in the State each year is usually worth between $300,000 and $400,000; in 1901, however, the amount rose to $494,637. The value of limestone quarried for that year was $330,927, a sum larger than usual. Clays found in the State are extensively utilized in the manufacture of brick and tile.

Agriculture. The State has a great diversity of physical conditions with a corresponding variation of soil and crops. The river valleys are generally fertile. The region known as the Central Basin contains a limestone soil of great fertility. In 1900 20,342,058 acres were included in farms, a little over half of this area being improved. While the farm area was but little greater in 1850 than in 1900, the improved area had almost doubled. The average size of farms decreased meanwhile from 261 acres to 90.6 acres. In 1900 12.6 per cent. of the farms were rented for cash, and 27.9 per cent. share rent, the latter having made a large gain during the decade ending with that year. Over one-seventh of the farms are operated by negroes, but only 22.4 per cent. of the negro farmers own their farms.

By far the largest and most valuable crop is corn, the acreage of which increased very considerably in the decade 1890-1900. Wheat is also an important cereal and much more than regained in the decade 1890-1900 what it had lost in the preceding decade. The cultivation of oats, the only other important cereal, has decreased. Cotton is one of the leading crops in the southwest corner of the State, and it is of much importance also in some of the northern counties. The area in hay and forage has increased more than threefold since 1880. Dry peas and sorghum cane are noteworthy products, as are also Irish and sweet potatoes. Peanuts are grown in large quantities in the Tennessee Valley. The climate is favorable to fruit culture, and in 1900 there were over 11,700,000 fruit trees, of which 7,700,000 were apple trees. There was a large increase in the number of all varieties of fruit trees in the decade ending with 1900. Of the 12,944 acres reported in small fruits in 1899, 11,548 acres were in strawberries. Watermelons and various vegetables are extensively raised. The following table is self-explanatory:

CROP	1900, acres	1890, acres
Corn	3,374,574	2,791,324
Wheat	1,426,112	877,361
Oats	285,313	588,138
Rye	16,556	26,443
Hay and forage	645,617	571,553
Cotton	623,137	747,471
Tobacco	71,849	51,471
Peanuts	19,584	16,244
Dry peas	82,841	....
Potatoes	27,103	36,992
Sweet potatoes	23,174	23,746
Sorghum cane	31,364	40,303

Stock-Raising. The number of cattle increased between 1870 and 1890, but decreased in the following decade. Both horses and mules increased in each decade from 1870 to 1900. Sheep, on the contrary, fell off in numbers. In 1899 $1,510,183 was received from sales of dairy products. The following table gives the number of stock for two census years:

	1900	1890
Dairy cows	321,676	345,311
Other cattle	590,507	620,028
Horses	352,388	311,842
Mules and asses	262,509	203,639
Sheep	307,804	540,996
Swine	1,976,984	1,922,912

Forests and Forest Products. Tennessee stood first among Southern States in 1900 in the value of its lumber products. It is estimated that the State contains 27,300 square miles of wooded area. Increased activity in the lumber industry began after 1880. The value of products more than doubled between 1890 and 1900. The value of planing mill products decreased during the same period.

Manufactures. Since 1880 the manufacturing industry has grown rapidly, the value of products increasing 95.2 per cent. in 1880-90, and 48.5 per cent. in the subsequent decade, the value in 1900 being $107,437,879. There were in the latter year 50,167 persons engaged as wage-earners in the industry. The recent growth is noteworthy in that textile manufacturing, the most prominent industry in a number of other Southern States, is not here important. The basis of the State's manufactures is its wealth of grain, timber, and minerals, together with its water power and advantages for river and railroad transportation. Flouring and grist mill products (whose value increased 74.8 per cent. between 1890 and 1900) and timber products each rank by far the first among the manufacturing interests. The abundance of coal and iron ore has given rise to a flourishing iron and steel industry, and to the manufacture of foundry and machine-shop products. The manufacture of cottonseed oil and cake is of greater importance than that of cotton textiles. The value of leather products in 1900 was more than twice that in 1890. There was a very large increase in the manufacture of tobacco products. The following table shows the relative importance of the leading branches for 1890 and 1900:

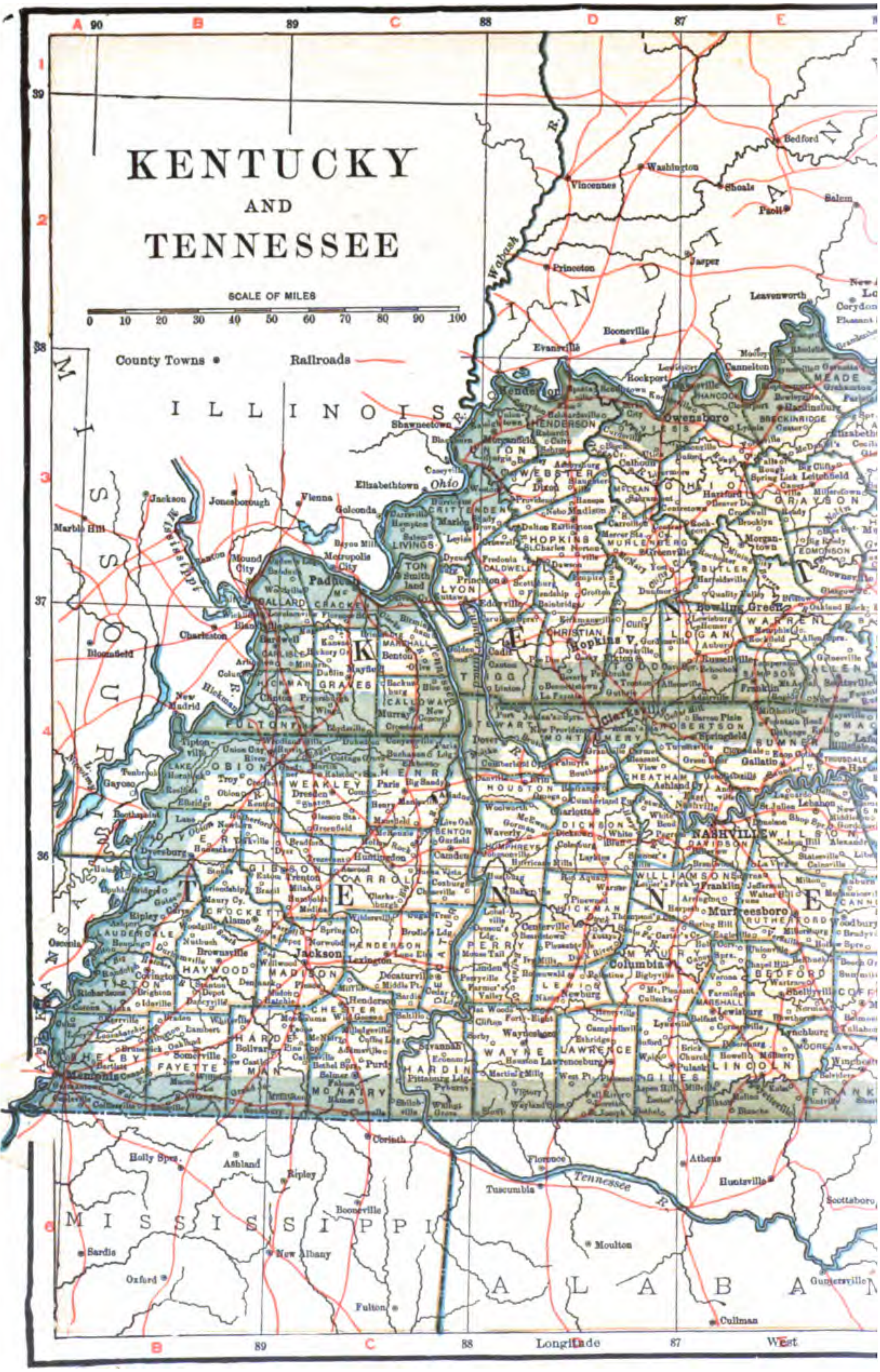
INDUSTRIES	Year	Number of establishments	Average number wage-earners	Value of products, including custom work and repairing
Total for selected industries for State	1900	3,787	28,478	$67,168,395
	1890	2,102	21,596	43,628,010
Increase, 1890 to 1900	......	1,685	6,882	$23,540,385
Per cent. of increase	......	80.2	31.9	54.0
Per cent. of total of all industries in State	1900	47.3	56.8	62.5
	1890	46.1	57.6	60.3
Flouring and grist-mill products	1900	1,618	1,154	$21,798,929
	1890	918	1,417	12,474,284
Foundry and machine-shop products	1900	95	3,146	4,074,509
	1890	68	2,620	4,427,187
Iron and steel	1900	16	1,979	5,080,624
	1890	15	1,472	4,247,868
Textiles—total	1900	72	4,251	3,907,279
	1890	69	3,051	3,724,138
Cotton goods	1900	17	2,108	1,994,935
	1890	20	2,124	2,507,719
Hosiery and knit goods	1900	4	511	395,150
	1890	....	....	....
Woolen goods	1900	51	1,632	1,517,194
	1890	49	927	1,216,419
Oil, cottonseed and cake	1900	17	751	2,980,041
	1890	15	1,030	2,504,741
Tobacco—total	1900	92	1,237	3,010,602
	1890	54	700	853,529
Chewing, smoking, and snuff	1900	35	615	1,541,475
	1890	24	531	577,690
Cigars and cigarettes	1900	35	161	290,647
	1890	25	139	236,807
Stemming and rehandling	1900	22	461	1,178,480
	1890	5	30	39,032
Leather, tanned, curried, and finished	1900	44	803	2,802,117
	1890	60	612	1,266,556
Cars and general shop construction and repairs by steam railroad companies	1900	16	2,817	3,113,053
	1890	10	1,772	1,605,778
Lumber and timber products	1900	1,732	11,192	18,127,784
	1890	820	7,424	9,073,686
Lumber, planing mill products, including sash, doors, and blinds	1900	85	1,148	2,273,457
	1890	73	1,498	3,450,243

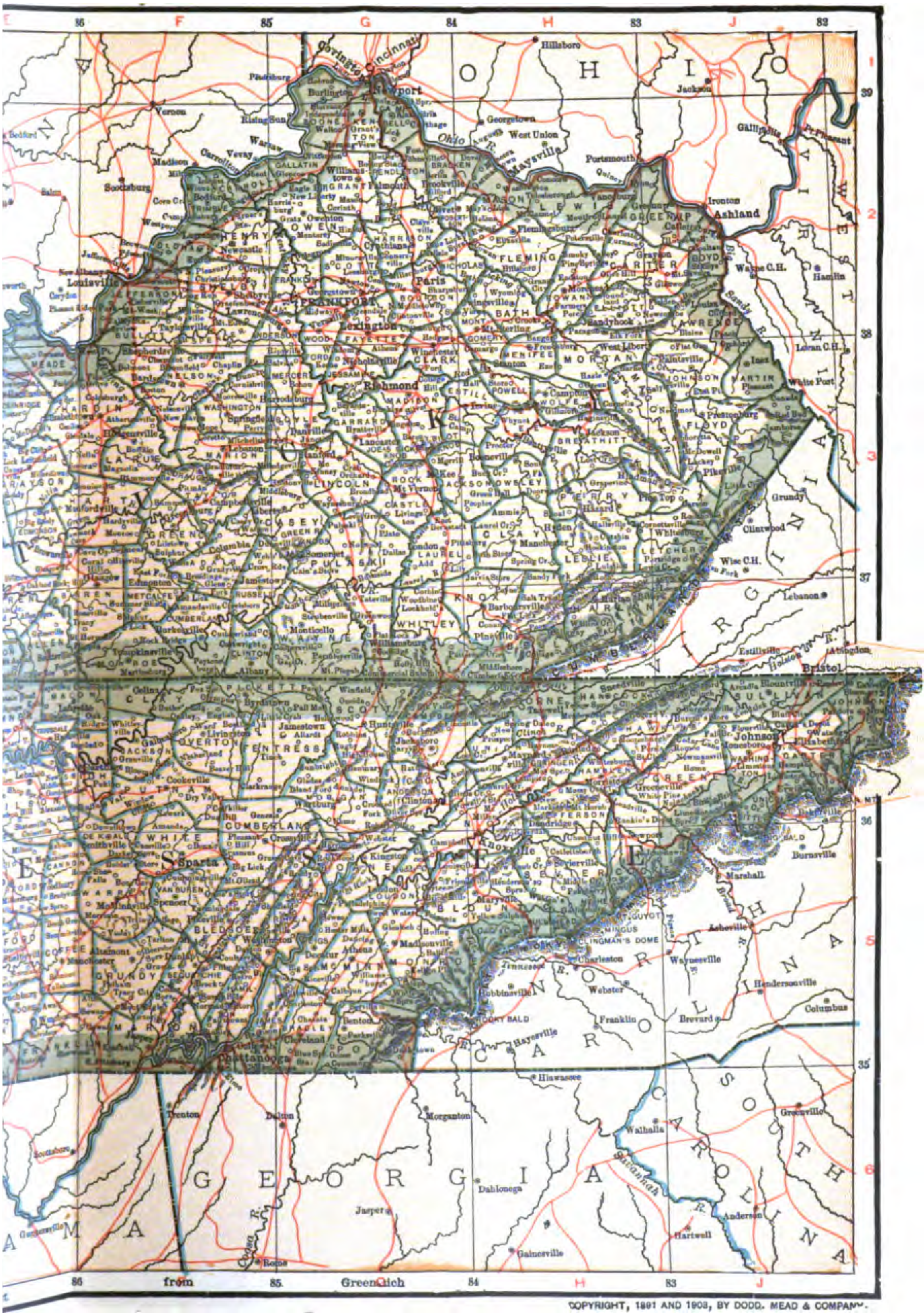
Transportation. The State has the advantage of water transportation afforded by the Mississippi and Tennessee rivers. A number of trunk line railroads cross the State, most of them centring in the State's chief port, Memphis. Among the railroads are the Nashville, Chattanooga and Saint Louis, the Louisville and Nashville, the Illinois Central, and the Southern. The mileage increased from 1253 in 1860 to 1843 in 1880, 2767 in 1890, and 3184 miles in 1900.

Banks. The first bank in the State was the Nashville Bank, established in 1807, with a capital of $200,000. In 1811 the Bank of the State of Tennessee followed, with the State as one of the stockholders. A second Bank of the State of Tennessee was in existence from 1820 to 1832. The State funds were transferred to the new Union Bank of Tennessee, with a capital of $3,000,000, of which $500,000 were subscribed by the State. The tendency to intrust the banking business to the State was still alive, and in 1838 the third venture was made by the organization of the Bank of Tennessee, with a capital of $5,000,000, all of which was to be supplied by the State, partly from funds on hand and partly by sale of bonds. It started with an actual capital of only $2,073,355, which was all the State could get together. The following twenty years were comparatively profitable for the banking business of the State, but the panic of 1857 forced many concerns into liquidation, and before they recovered from it the great political conflict came, almost destroying the banking institutions. In 1866, by order of the Legislature, the Bank of Tennessee was formally placed in liquidation, when its assets of $12,478,483 were found to consist mainly of Confederate bonds, certificates, treasury bonds, etc. In 1883 the State finally assumed the liability for the bank notes, and they were redeemed for special certificates of indebtedness. The depositors of the bank, including the State school fund, never realized anything. In 1869 there were 13 national banks and one State bank. The State banking system regained its ground after 1890. The present free banking law is lax. There is no system of bank examinations and no governmental control, and the liability of stockholders is strictly limited. The Constitution

AREA AND POPULATION OF TENNESSEE BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Anderson	G 4	Clinton	350	15,128	17,634
Bedford	E 5	Shelbyville	489	24,739	23,845
Benton	C 4	Camden	430	11,230	11,888
Bledsoe	F 5	Pikeville	400	6,134	6,626
Blount	H 5	Maryville	552	17,589	19,206
Bradley	G 5	Cleveland	325	13,607	15,759
Campbell	G 4	Jacksboro	477	13,486	17,317
Cannon	E 5	Woodbury	325	12,197	12,121
Carroll	C 5	Huntingdon	624	23,630	24,250
Carter	J 4	Elizabethton	345	13,389	16,688
Cheatham	C 4	Ashland City	347	8,845	10,112
Chester	C 5	Henderson	300	9,069	9,896
Claiborne	H 4	Tazewell	464	15,103	20,696
Clay	F 4	Celina	260	7,260	8,421
Cocke	H 5	Newport	420	16,523	19,153
Coffee	E 5	Manchester	442	13,827	15,574
Crockett	B 5	Alamo	267	15,146	15,867
Cumberland	F 4	Crossville	548	5,376	8,311
Davidson	E 4	Nashville	520	108,174	122,815
Decatur	C 5	Decaturville	287	8,995	10,439
Dekalb	F 5	Smithville	322	15,650	16,460
Dickson	D 4	Charlotte	600	13,645	18,635
Dyer	B 5	Dyersburg	500	19,878	23,776
Fayette	B 5	Somerville	618	28,878	29,701
Fentress	F 4	Jamestown	445	5,226	6,106
Franklin	E 5	Winchester	610	18,929	20,392
Gibson	C 5	Trenton	625	35,859	39,408
Giles	D 5	Pulaski	605	34,957	33,035
Grainger	H 4	Rutledge	309	13,196	15,512
Greene	B 5	Greenville	615	26,614	30,596
Grundy	F 5	Altamont	375	6,345	7,802
Hamblen	H 4	Morristown	165	11,418	12,728
Hamilton	F 5	Chattanooga	427	53,482	61.695
Hancock	H 4	Sneedville	208	10,342	11,147
Hardeman	B 5	Bolivar	655	21,029	22,976
Hardin	C 5	Savannah	587	17,698	19,246
Hawkins	H 4	Rogersville	490	22,246	24,267
Haywood	B 5	Brownsville	520	23,558	25,189
Henderson	C 5	Lexington	515	16,336	18,117
Henry	C 4	Paris	625	21,070	24,208
Hickman	D 5	Centerville	655	14,499	16,367
Houston	D 4	Erin	200	5,390	6,476
Humphreys	C 4	Waverly	435	11,720	13,398
Jackson	F 4	Gainesboro	395	13,325	15,039
James	F 5	Ooltewah	160	4,903	5,407
Jefferson	H 4	Dandridge	310	16,478	18,590
Johnson	J 4	Mountain City	290	8,858	10,589


KENTUCKY
AND
TENNESSEE
SCALE OF MILES
0 10 20 30 40 50 60 70 80 90 100
County Towns ●
Railroads
A 90
B
89
C
88
D
87
E
1
39
2
38
3
37
4
36
5
6
ILLINOIS
INDIANA
MISSOURI
ARKANSAS
MISSISSIPPI
ALABAMA
KENTUCKY
TENNESSEE
Mississippi R.
Ohio R.
Wabash R.
Tennessee R.
Cumberland R.
Vincennes
Washington
Shoals
Bedford
Paoli
Salem
Princeton
Jasper
Evansville
Boonesville
Leavenworth
Corydon
Shawneetown
Elizabethtown
Golconda
Metropolis
Jonesborough
Jackson
Vienna
Mound City
Marble Hill
Charleston
Bloomfield
New Madrid
Henderson
Owensboro
Hawesville
Hardinsburg
Morganfield
Madison
Hopkinsville
Paducah
Bowling Green
Russellville
Clarksville
Springfield
Gallatin
Lebanon
Nashville
Franklin
Murfreesboro
Columbia
Shelbyville
Paris
Dresden
Union City
Huntingdon
Trenton
Dyersburg
Jackson
Brownsville
Covington
Lexington
Memphis
Somerville
Bolivar
Savannah
Waynesboro
Lawrenceburg
Pulaski
Fayetteville
Corinth
Holly Sprs.
Ashland
Ripley
Booneville
Sardis
New Albany
Oxford
Fulton
Florence
Tuscumbia
Athens
Huntsville
Moulton
Scottsboro
Cullman
Guntersville
Longitude
West



COPYRIGHT, 1891 AND 1903, BY DODD, MEAD & COMPANY.

AREA AND POPULATION OF TENNESSEE BY COUNTIES.

(Continued.)

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Knox	H 4	Knoxville	520	59,557	74,302
Lake	B 4	Tiptonville	128	5,304	7,368
Lauderdale	B 5	Ripley	460	18,756	21,971
Lawrence	D 5	Lawrenceburg	590	12,286	15,402
Lewis	D 5	Hohenwald	295	2,555	4,455
Lincoln	E 5	Fayetteville	597	27,382	26,304
Loudon	G 5	Loudon	230	9,273	10,838
McMinn	G 5	Athens	437	17,890	19,163
McNairy	C 5	Selmer	570	15,510	17,760
Macon	F 4	Lafayette	280	10,878	12,881
Madison	C 5	Jackson	545	30,497	36,333
Marion	F 5	Jasper	504	15,411	17,281
Marshall	E 5	Lewisburg	315	18,906	18,763
Maury	D 5	Columbia	632	38,112	42,703
Meigs	G 5	Decatur	210	6,930	7,491
Monroe	G 5	Madisonville	668	15,329	18,585
Montgomery	D 4	Clarksville	548	29,697	36,017
Moore	E 5	Lynchburg	145	5,975	5,706
Morgan	G 4	Wartburg	540	7,639	9,587
Obion	B 4	Union City	505	27,273	28,286
Overton	F 4	Livingston	459	12,039	13,353
Perry	D 5	Linden	520	7,785	8,800
Pickett	F 4	Byrdstown	165	4,736	5,336
Polk	G 5	Benton	437	8,361	11,357
Putnam	F 4	Cookeville	430	13,683	16,890
Rhea	G 5	Dayton	365	12,647	14,318
Roane	G 5	Kingston	442	17,418	22,738
Robertson	D 4	Springfield	500	20,078	25,029
Rutherford	E 5	Murfreesboro	605	35,097	33,543
Scott	G 4	Huntsville	595	9,794	11,077
Sequatchie	F 5	Dunlap	263	3,027	3,326
Sevier	H 5	Sevierville	588	18,761	22,021
Shelby	B 5	Memphis	769	112,740	153,557
Smith	F 4	Carthage	334	18,404	19,026
Stewart	D 4	Dover	495	12,193	15,224
Sullivan	J 4	Blountville	430	20,879	24,935
Sumner	E 4	Gallatin	520	23,668	26,072
Tipton	B 5	Covington	430	24,271	29,273
Trousdale	E 4	Hartsville	107	5,850	6,004
Unicoi	J 4	Ervin	189	4,619	5,851
Union	H 4	Maynardville	237	11,459	12,894
Van Buren	F 5	Spencer	275	2,863	3,126
Warren	F 5	McMinnville	444	14,418	16,410
Washington	J 4	Jonesboro	325	20,354	22,604
Wayne	D 5	Waynesboro	757	11,471	12,936
Weakley	C 4	Dresden	565	28,955	32,546
White	F 5	Sparta	370	12,348	14,157
Williamson	D 5	Franklin	500	26,321	26,429
Wilson	E 4	Lebanon	552	27,148	27,078

prohibits the State forming a bank or even holding stock in one. The condition of the various banks in 1902 is shown below:

	National banks	State banks
Number of banks	59	153
Capital	$7,140,000	$6,463,000
Surplus	1,845,000	1,554,000
Cash, etc	2,615,000	4,791,000
Deposits	26,780,000	24,714,000
Loans	26,339,000	19,949,000

Government. The present Constitution was adopted in February, 1870. Proposed amendments must receive a majority vote of the members elected to each House of two consecutive Legislatures, followed by a majority approval of all the citizens voting for Representatives. The Legislature cannot propose amendments oftener than once in six years. The Legislature can at any time submit to the people the question of a new constitutional convention, a majority of the votes cast being decisive. Voters must be United States citizens who have resided in the State twelve months, in the county six months, and have paid poll taxes.

There is a maximum limit of 99 to the number of Representatives and the Senators are limited to one-third the number of Representatives. Both are elected for a term of two years, elections being held on the first Tuesday after the first Monday in November of the even years, and the Legislature meeting on the first Monday in the following January. Members receive $4 per day and mileage, but the wage shall not exceed seventy-five days for a regular session, or twenty days for an extra session. Ministers and priests are ineligible to the Legislature, and atheists and duelists to any civil office.

The executive power is vested in a Governor who is chosen every two years; a Secretary of State, elected by the Legislature for four years; a Treasurer and Comptroller of the Treasury, elected in the same manner for two years; an Attorney-General, appointed by the Supreme Court judges, and who serves six years; and a State Superintendent of Schools, nominated by the Governor and confirmed by the Senate, serving two years. The Governor can call extra sessions, and has the pardoning and veto power. His veto, however, is overridden by a majority vote of the members elected to each House. There is a Supreme Court of five judges, elected for eight years. Judges of the circuit, chancery, and other inferior courts are elected by their respective districts for eight years. Nashville is the capital. The State has 10 Representatives in the Lower House of Congress.

Militia. In 1900 the State had 384,249 men of militia age. The organized militia in 1901 numbered 1304.

Finances. The history of the public debt constitutes the most important and interesting part of the financial history of the State. The first debt was created in 1832 and 1838 for the purpose of establishing State banks. Between 1840 and 1850 the State inaugurated the system of public improvements. Bonds were issued to turnpike and railroad companies for construction, and first mortgages were the usual guarantees. In 1861 the total amount of bonds outstanding was over $18,000,000, and a war loan of $3,000,000 was added. The four years of the Civil War destroyed the sources of State income, made payment of interest impossible, and swelled the total indebtedness considerably. In 1865 it rose to $25,277,406, out of which $5,169,740 was interest overdue. The current interest charges alone amounted to $1,185,048, while the revenue was far below it, taxation inadequate, and the amount actually collected considerably less than the sum assessed. Most of the companies to which the bonds were issued failed to pay the interest. The carpet-bag régime that followed the Civil War did not improve matters. New bonds to the amount of $3,408,000 were issued to 14 railroad companies in 1868, interest remained unpaid, and in 1869 the total debt reached $39,896,504. Measures of relief were then passed by the Legislature; sale of the delinquent roads was authorized, and the solvent railroads were permitted to pay their debts in State bonds which were below par. By these means the debt was rapidly reduced to $27,920,386 in 1874. Yet even then the State was unable to meet its obligations. Repudiating began to be talked of toward 1880, and, frightened by this agitation the bondholders began to offer various plans of settlement. A plan of refunding at 50 per cent. was agreed to by the bondholders and the Legislature in 1879, but was rejected by popular vote.

In that year the debt question was the main campaign issue, and the repudiation party lost. A final settlement was reached in 1883, when the State debt proper was scaled down 20-24 per cent. and the railroad guarantee bonds 50 per cent. The total debt was reduced by this operation from $28,000,000 to about $15,000,000. The conversion was completed in 1890. In 1900 the public debt was $17,023,600. The general tax is at present the main source of income (about 50 per cent.). Licenses give 25 per cent. and a tax on railroad and other corporations about 15 per cent. The net receipts in 1900 (omitting the operations of the loan accounts) were $2,069,624, the net disbursements $1,801,911.

Population. The population increased from 35,691 in 1790 to 422,823 in 1820, 1,002,717 in 1850, 1,109,801 in 1860, 1,258,520 in 1870, 1,542,359 in 1880, 1,767,518 in 1890, and 2,020,616 in 1900. From lowest in rank among the States it rose to fifth in 1850 and declined to fourteenth in 1900. The negro population in 1900 numbered 480,430, showing an increase of less than 200 over 1890. There were 17,746 foreign born. The population per square mile in 1900 was 48.4. In that year there were nine cities which had more than 4000 inhabitants each. In 1900 Memphis had a population of 102,320; Nashville, 80,865; Knoxville, 32,637; Chattanooga, 30,154; and Jackson, 14,511.

Religion. About two-fifths of the church membership is Methodist and about one-third Baptist. The Presbyterians and the Disciples of Christ also have strong followings.

Education. In 1900, 20.7 per cent. of the population over ten years of age were illiterate. This was a reduction from 38.7 in 1880. The per cent. for the native white population was 14.2 and for the colored 41.6. In 1900 there were 573,287 whites and 195,556 colored persons between the ages of 6 and 21. The school enrollment for that year was 485,354 and the average attendance 270,662 whites and 67,904 colored. Between 1875 and 1900 much progress was made, and the State is in advance of most Southern States. There is a State Superintendent of Public Schools nominated biennially by the Governor and confirmed by the Senate. For local supervision a superintendent for each county is chosen by the County Court biennially; and in each district there are three directors, elected by the people for three years, one going out each year. The law requires State and county superintendents to be persons of literary and scientific attainments and of skill and experience in the art of teaching. The county courts may elect boards of education in their respective counties, and these boards have authority to establish one or more high schools in their county. The text books used are uniform throughout the State. In the country districts the primary course covers six years, but two additional years may be taken in many districts in the so-called secondary school. In 1900 there were 4960 male and 4235 female teachers. The expenditure upon the country schools for the year was $1,751,047, of which $1,403,848 was for salaries of superintendents and teachers. There was an additional $597,006 expended for city schools. Normal school training is provided for by the Peabody College for Teachers (q.v.) at Nashville. A large number of students at this institution are aided by the grants of scholarships. The higher institutions of learning include some of national reputation. See TENNESSEE, UNIVERSITY OF; NASHVILLE, UNIVERSITY OF; VANDERBILT UNIVERSITY; FISK UNIVERSITY.

CHARITABLE AND PENAL INSTITUTIONS. There is an unsalaried Board of Charities appointed by the Governor which investigates the whole system of public charities and correctional institutions, and reports thereon to the Legislature. The plans for new buildings, modifications, etc., must be submitted to it for suggestions and criticism. The State maintains three hospitals for the insane, namely, the Western Hospital near Bolivar, the Central Hospital near Nashville, and the Eastern Hospital near Knoxville. There is a State school for the deaf at Knoxville, one for the blind at Nashville, and an industrial school at Nashville. The State also maintains a Confederate soldiers' home near Nashville. The main prison at Nashville had on December 1, 1902, 923 convicts, and the branch prison at Petros had 762 convicts on the same date. Over two-thirds of the total number are negroes. The prisoners at the branch prison are worked in coal mines, but are not leased to contractors. The revenue from convict labor is greater than the cost of maintaining the convicts.

HISTORY. Probably De Soto (q.v.) reached the Mississippi at the present site of Memphis in 1541. La Salle, about 1682, built a fort at this point, and called it Fort Prud'homme. The place was again occupied by the French in 1714. The grant by Charles II. to the Lords Proprietors of Carolina of the territory between latitudes 29° and 36° 30′ N. in 1665 included this territory. (See NORTH CAROLINA.) The first English settlement was Fort Loudon, built in 1756, at the suggestion of Governor Loudon of Virginia, and garrisoned by royal troops, but afterwards captured by the Cherokees. Before this, however, Dr. Thomas Walker with a party of Virginians had named the Cumberland River and Mountains, and Daniel Boone (q.v.) and others had entered the wilderness, which was regarded as a common hunting ground by the Cherokees, Creeks, Miamis, Choctaws, and Chickasaws. In 1768 the Iroquois, who claimed sovereignty by conquest, ceded their claim to the English, and in 1769 William Bean's cabin on the Watauga marked the beginning of real settlement. James Robertson (q.v.) and others came in 1770, another settlement was made near Rogersville in 1771, and soon after Jacob Brown opened a store on the Nollichucky. After the defeat of the Regulators (q.v.) in North Carolina, a great number of settlers came, supposing the territory to be Virginia soil. When the territory was found to be within North Carolina, the inhabitants of the first two settlements met in 1772 and formed the Watauga Association (q.v.), which served as a form of government for several years. In 1775 Col. Richard Henderson (q.v.) bought from the Indians the territory between the Cumberland and the Kentucky Rivers. More settlers came in 1778-79 and in 1780 a compact of government was drawn up at Nashborough, by Col. Henderson, who had been Chief Justice of North Carolina, and James Robertson, who had been one of the signers of the Watauga Association. These two compacts were much alike and served their purpose excellently.

The Watauga settlers in 1775 or 1776 gave the name Washington District to their colony, and in 1776 it was annexed to North Carolina, though some had dreamed of a separate State. The number of settlers increased rapidly and nearly 500 men under John Sevier (q.v.) and Isaac Shelby (q.v.) went across the mountains and took part in the attack on the British under Ferguson, at King's Mountain (q.v.), in 1780. All this time the settlers were harassed by severe Indian wars. In 1784 North Carolina ceded to the General Government all the territory of the present State on condition that the cession be accepted within two years, but retained until that time full sovereignty. The inhabitants, indignant at being transferred without their consent, and thinking that they had been abandoned, elected delegates from each military company, who met at Jonesboro, August 23, 1784, and formed the State of Franklin, or Frankland; John Sevier was chosen Governor. Congress ignored the request to be recognized as a State and North Carolina promptly repealed the act of cession and asserted its jurisdiction. Civil war was averted by the tact of the North Carolina Governors. Confusion, however, reigned, as there were two bodies of officers, and many settlers neglected to pay taxes to either, though furs, skins, and other articles were made legal tender by the infant State. At the expiration of Sevier's term in 1788, the State of Franklin ended. In this attempt at Statehood the Cumberland settlers did not join. Davidson County was laid out in 1783 and the Davidson Academy (now the University of Nashville) was founded in 1785. Indian troubles threatened the life of the settlement, and the intrigues of the Spaniards, who still held Louisiana and the Mississippi, made the position more difficult. See MCGILLIVRAY, ALEXANDER.

In February, 1790, North Carolina again ceded the territory to the General Government, stipulating that all the advantages of the Ordinance of 1787 (q.v.) should be preserved to the inhabitants, except that slavery should not be prohibited. The act of government for the 'Territory South of the Ohio' was passed in April, 1790, and the seat of government was moved from Rogersville to Knoxville. The Indians were severely punished in 1794 and the Spanish influence was broken. In the same year the first Territorial Assembly met. In 1795, as the territory was found to contain more than 60,000 white inhabitants, a constitutional convention was called. which met in January, 1796. A constitution for the 'State of Tennessee' modeled after that of North Carolina was adopted without submission to popular vote; the first General Assembly met March 28th, and the State was admitted June 1, 1796. Almost from the date of admission there was a sharp distinction between East and Middle (West) Tennessee, which was recognized in the appointment of the judiciary. In wealth and material progress the mountainous eastern part lagged behind. The western part of the State began to fill up after 1818, Memphis was laid out in 1819, and three sections came now to be recognized in law. The progress of the State was rapid, though the growth was almost entirely along agricultural lines. The State early began to construct internal improvements. Turnpike roads were built in 1804, and after 1823 roads and canals were pushed forward. The first railroad was chartered in 1831, but the Memphis and Charleston road was not built until 1857. Much State aid was voted to the railroads, and the redemption of the bonds issued for this purpose was a political issue as late as 1882. The eastern part of the State did not share equally in these benefits.

There was a strong Union party in the State at the outbreak of the Civil War, and in February, 1861, the people refused to hold a convention to consider secession, but with President Lincoln's call for troops sentiment changed, and through the influence of Governor Harris the State declared itself by popular vote out of the Union, June 8th, though East Tennessee had voted against secession more than two to one. On June 17th a Union convention of delegates from the eastern counties and a few middle counties met at Greeneville and petitioned to be allowed to form a separate State. The request was ignored by the Legislature, and the presence of a Confederate army prevented further action on the part of the Unionists. During the war the State furnished about 115,000 soldiers to the Confederate cause and 31,092 to the Federal army. When the advance of Federal troops drove Governor Harris from Nashville, Andrew Johnson (q.v.), who had refused to resign his seat in the United States Senate on the secession of the State, was appointed military governor. He attempted to reorganize the State in 1864, and sent up Lincoln electors, who were rejected by Congress. In 1865 the Radical Legislature proceeded to extreme measures. Suffrage was extended to negroes under the Constitution of 1834, which gave that right to every freeman. The State was readmitted July 23, 1866, but there was much disorder. The Ku-Klux Klan (q.v.) appeared, and in 1869 nine counties in Middle and West Tennessee were declared under martial law. For a time after the war the recovery of the State was slow, but the development of the past twenty years has been exceedingly rapid. The principal events have been the conflicts between convict and free labor in the mines in 1891-93, and the Tennessee Centennial Exposition (q.v.), held at Nashville in 1897.

In the Presidential elections Tennessee chose Democratic-Republican electors from 1796 to 1824. In 1828 and again in 1832 the only issue was Jackson, and the voters were almost unanimous for him. In 1836, however, Hugh Lawson White, the States-Rights Democrat, was successful in spite of Jackson's efforts. From 1840 to 1852 Whig electors were chosen, Clay receiving the vote in 1844, though Polk was a resident of the State. In 1856 the vote was cast for Buchanan. The Constitutional Union ticket headed by John Bell was successful in 1860. The State voted for Grant in 1868, but since that time it has been Democratic. From the State have come many men of national reputation, including three Presidents, Jackson, Polk, and Johnson.

GOVERNORS OF TENNESSEE

STATE OF FRANKLIN

John Sevier	1785-88

TERRITORY SOUTH OF THE OHIO

William Blount	1790-96

STATE OF TENNESSEE

John Sevier	Democratic-Republican	1796-1801
Archibald Roan	" "	1801-03
John Sevier	" "	1803-09
Willie Blount	" "	1809-15
Joseph McMinn	" "	1815-21
William Carroll	" "	1821-27
Sam Houston	" "	1827-29
William Hall (acting)		1829
William Carroll	Democrat	1829-35
Newton Cannon	States-Rights Democrat	1835-39
James K. Polk	Democrat	1839-41
James C. Jones	Whig	1841-45
Aaron V. Brown	Democrat	1845-47
Neil S. Brown	Whig	1847-49
William Trousdale	Democrat	1849-51
William B. Campbell	Whig	1851-53
Andrew Johnson	Democrat	1853-57
Isham G. Harris	"	1857-62
Andrew Johnson	Military	1862-65
Interregnum		4th March-5th April, 1865
William G. Brownlow	Republican	1865-69
DeWitt C. Senter	Conservative-Republican	1869-71
John C. Brown	Democrat	1871-75
James D. Porter	"	1875-79
Albert S. Marks	"	1879-81
Alvin Hawkins	Republican	1881-83
William B. Bate	Democrat	1883-87
Robert L. Taylor	"	1887-91
John P. Buchanan	"	1891-93
Peter Turney	"	1893-97
Robert L. Taylor	"	1897-99
Benton McMillin	"	1899-1903
James B. Frazier	"	1903—

BIBLIOGRAPHY. Killebrew and Safford, *Introduction to the Resources of Tennessee* (Nashville, 1874); Killebrew, *Tennessee, Its Agricultural and Mineral Wealth* (ib., 1877); Wright, "Antiquities of Tennessee," in *Smithsonian Institution Report for 1874* (Washington, 1875); Jones, "Explorations of the Aboriginal Remains of Tennessee," in *Smithsonian Institution Contributions to Knowledge*, vol. xxii. (Washington, 1876); Gates, *West Tennessee, Its Advantages and Its Resources* (Jackson, Tenn., 1885); Thruston, *The Antiquities of Tennessee* (2d ed., Cincinnati, 1897). For history, consult: Roosevelt, *The Winning of the West* (New York, 1889-96); Putnam, *History of Middle Tennessee* (Nashville, 1859); Phelan, *History of Tennessee* (Boston, 1889); Haywood, *Civil and Political History of*

Tennessee (Nashville, 1891); Caldwell, *Studies in the Constitutional History of Tennessee* (Cincinnati, 1895); Allison, *Dropped Stitches in Tennessee History* (Nashville, 1897); McGee, *History of Tennessee* (New York, 1899); Temple, *East Tennessee and the Civil War* (Cincinnati, 1899); Fertig, *Secession and Reconstruction of Tennessee* (University of Chicago Press, 1898); *Tennessee Historical Society Papers.*

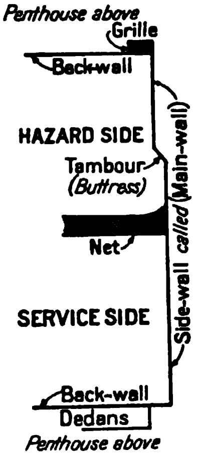
TENNESSEE, The. A formidable Confederate ram crippled by the *Hartford* of Admiral Farragut's fleet, and taken in Mobile Bay on August 5, 1864.

TENNESSEE, University of. A coeducational State institution at Knoxville, Tenn., founded in 1794 as Blount College. Its title was changed in 1807 to East Tennessee College, in 1840 to East Tennessee University, and in 1879 to its present name. The institution comprises the College of Agriculture and Mechanic Arts and the university proper. The college has an agricultural department with a four years' course and a short course for farmers; an engineering department with four years' courses in mechanical, electrical, and civil engineering and chemistry; a literary department; and an industrial department for colored students (Knoxville College). The university consists of an academic department with courses for the graduate degrees of M.A. and M.S. and professional courses in engineering, law, medicine, and dentistry, the medical and dental departments being situated in Nashville. University extension work is carried on by means of teachers' institutes, farmers' institutes and conventions, and conferences on education. A summer school and a department of education have also been established. The university has a liberal system of accredited scholars whose certificates are accepted in place of the entrance examinations. The State has established 275 free scholarships in the academic department, and one free scholarship is given to each accredited school outside the State. The attendance in 1903 was 756 and the faculty numbered 120. The library contained about 20,000 volumes. The endowment in that year was $425,000 and the income about $103,716.29. The grounds and buildings were valued at $491,929.98.

TENNESSEE CENTENNIAL EXPOSITION. An exposition held in Nashville, Tenn., May 1 to October 30, 1897, to celebrate the one hundredth anniversary of the admission of the State into the Union. The site covered about 200 acres, and a characteristic feature of the landscape plan was the sward planted with the famous blue grass of the region. The buildings, of which there were over a hundred, included those devoted to agriculture, commerce, education, fine arts, history, machinery, minerals and forestry, and transportation, as well as those in which the special exhibits pertaining to children, negroes, the United States Government, and women were shown. The total attendance was 1,786,714, of which the total paid attendance was 1,166,692. The total receipts were $1,101,285, and the disbursements $1,101,246. Consult Justi, *Official History of the Tennessee Centennial Exposition* (Nashville, 1898).

TENNESSEE RIVER. The largest tributary of the Ohio. It is formed by the union of the Holston and the North Fork, which rise in the Alleghany Mountains of southwestern Virginia, and unite near Kingsport in the northeastern part of Tennessee (Map: Kentucky, C 4). According to some authorities the Holston extends to the junction with the French Broad River at Knoxville, and according to others even to the Clinch River at Kingston. The river flows first southwest between the Alleghany ridges, and then makes a great waving curve through northern Alabama from its northeastern to its northwestern corner. Reëntering Tennessee, it flows northward across the State, then northwest across Kentucky to its confluence with the Ohio at Paducah. Its length, including the Holston, is 1200 miles. Its chief affluents are the French Broad, the Clinch, Hiawassee, Sequatchie, Elk, and Duck. Except at the Muscle Shoals in Alabama, navigation is unobstructed from the mouth of the river to Chattanooga, a distance of 450 miles. The Muscle Shoals are a series of rapids, where the river flows over limestone rocks from Florence to Decatur, a distance of 23 miles, but navigation around them has been effected by means of a canal and locks, completed by the United States Government in 1889. Above the Shoals small steamers may ascend the river to Knoxville. Besides Knoxville, the chief cities along its banks are Florence and Decatur in Alabama, and Chattanooga in Tennessee.

TENNIEL, tĕn-nēl′, Sir John (1820—). An English painter and illustrator, born in London. He was practically self-taught. In 1845 he won a prize in the competition for the decoration of Westminster Palace, with a cartoon, "Allegory of Justice," the success of which also secured for him the commission to paint a fresco, Dryden's "Saint Cecelia," in the House of Lords. His most successful work, however, has been in black-and-white. From 1852 to 1901 he was cartoonist for *Punch*, executing over 2000 cartoons. His reputation rests chiefly upon his book illustrations. Among the principal are his drawings for *Æsop's Fables* (1848); Moore's *Lalla Rookh* (1861); Lewis Carroll's *Alice's Adventures in Wonderland* (1866). and its sequel, *Through the Looking Glass* (1870); the *Ingoldsby Legends;* and his classical illustrations to the *Legendary Ballads.* In the statuesque and ideal character of the figures, his work recalls the German influence prevalent at the middle of the nineteenth century.



Plan of the right-hand side wall or main wall looked at from above at the *dedans.*

TENNIS (of uncertain derivation; possibly from OF. *tenez*, impv. of *tenir*, to seize, take, i.e. the ball). A game played with racquet and ball in a covered court. It has been well described as the mother of lawn tennis (q.v.). It is usually played by two players, a four-handed game being rarely met with in modern tennis. The racquet is of the large-headed, large-handled variety. It has a smaller face but is heavier than the lawn-tennis racquet, in order to counteract the ball, which is heavier than the lawn-tennis ball, although about the same size. The court has walls on all its four sides, and a penthouse along three sides. The spectators are accommodated in the *dedans*. A ball played over the net into this *dedans* counts as a winning stroke to the striker. In front of the *dedans*, over the net and down the right-hand wall, is a *tambour* or protruding buttress. Past the tambour in the wall directly opposite the *dedans* is the grille. A ball played over the net into this grille makes a winning stroke. In the left-hand side wall there are many openings protected with nettings called galleries, the last gallery being known as the winning gallery, owing to the fact that a ball played over the net into it counts as a winning stroke. All the way down the left-hand side of the court runs the penthouse above the galleries. The penthouse also extends over the dedans and the grille. In tennis, the set consists of six games, though 'deuce' and 'vantage' games may be played, while 'faults' and 'double faults' score as in lawn tennis. The ball must be hit over the net before it is bounded twice, and the scoring is the same as in the better known forms of the game, e.g. 15 love, 15 all, 30-15, 30 all, 40-30, deuce, vantage, deuce, vantage, game.

TEN'NYSON, Alfred, first Baron Tennyson (1809-92). The most representative English poet of Victoria's reign. He was born on August 6, 1809, at Somersby, in Lincolnshire, a village of which his father was rector. Two of his brothers also displayed no slight poetic gifts, Frederick (q.v.), and Charles, afterwards known as Charles Tennyson Turner (q.v.). Alfred spent four years (1816-20) at the grammar school of Louth, a few miles from his home, and for the next eight years his education was directed by his father, a man of some literary talent. He roamed through the woods, laying the foundations of that knowledge of nature for which his verse is conspicuous, read extensively, and tried his hand in the manner of Pope, Thomson, Scott, Moore, and Byron. Fragments of this early work found their way into *Poems by Two Brothers* (1827; reprinted 1893), written in conjunction with his brother Charles. In 1828 the two brothers entered Trinity College, Cambridge, to which Frederick had gone a year earlier. At the university Tennyson was associated with a remarkable group of young men, most of whom formed the famous society known as 'The Apostles.' To this group belonged Thackeray, Spedding, Trench, Monckton Milnes, afterwards Lord Houghton, Merivale, Alford, and Arthur Henry Hallam, son of the historian, who discerned his friend's genius and in 1829 told Gladstone that Tennyson "promised fair to be the greatest poet of our generation, perhaps of our century."

In that same year, with *Timbuctoo*, a poem in blank verse, Tennyson won the Chancellor's gold medal, and while still in residence published the epoch-making volume of *Poems, Chiefly Lyrical*. In 1830, when the slim little book appeared, poetry seemed to be dead. Murray had given up publishing verse, and the novel, under the impulse of the unprecedented success of the *Waverley* series, held the field. Showing the influence of Coleridge and Keats, the poems in this volume were in no sense imitative; rather, they contain in germ nearly all of Tennyson's great original qualities. In the same year he traveled in the Pyrenees with Hallam, and there, in the Valley of Cauterets, he wrote parts of "Œnone."

He left Cambridge without a degree in February, 1831, for various reasons, but chiefly the ill health of his father, who died a few weeks later. The family, however, remained at Somersby for six years longer. The second volume of *Poems* (1833) contained many of his choicest minor pieces: "The Lady of Shalott," "The Miller's Daughter," "The Palace of Art," "The Lotos-Eaters," and "A Dream of Fair Women." Beyond the circle of the poet's friends, the collection was not well received; Lockhart wrote an especially brutal review in the *Quarterly* for April. In September a life-long sorrow fell upon the poet in the death of Hallam, his dearest friend, who was at that time engaged to his sister Emily. For ten years he remained silent, reading largely, revising old poems, and writing new ones. By 1836 he had definitely given his heart to his future wife, Emily Sarah Sellwood, the sister of his brother Charles's wife. But, though deficiency of income seemed an insuperable bar to marriage, and though her relatives forbade even correspondence, Tennyson had no thought of deserting the art to which his life belonged to take up any profession more lucrative than poetry.

In 1842 he gained his public with *Poems* in two volumes, representing a wide range of theme and metrical structure. Here first appeared "Morte d'Arthur," the first sketch of the *Idylls of the King;* "Ulysses," "Locksley Hall," "Godiva," "Break, break, break," and "The Two Voices." Tennyson's place in English poetry was now secure; but fortune seemed far off. His little capital was shattered by a strange investment in wood-carving machinery; and in 1845 Peel was moved by Lord Houghton to grant him a civil-list pension of £200. In 1847 appeared *The Princess*, a romantic medley in musical blank verse, marked at every point by his "curious felicity" of style, and containing some wonderful lyrics. The year 1850 has been called his *annus mirabilis*. In June he published *In Memoriam*, a tribute to the memory of Arthur Hallam. At first not well understood, it has now definitely taken its place with *Lycidas*, *Adonais*, and *Thyrsis* at the head of English elegies. In the same month he married Miss Sellwood (with whom, he said afterwards, "the peace of God came into my life"); and in November he was appointed poet laureate in succession to Wordsworth.

He settled with his bride at Twickenham, where he lived for three years. Then he leased and shortly afterwards purchased the estate of Farringford, near Freshwater, in the Isle of Wight, where he lived until 1870. After that he divided his time between Farringford and Aldworth, a house which he built on Blackdown Hill, near Haslemere.

In 1855 appeared *Maud, and Other Poems*. "Maud," a great favorite with Tennyson, puzzled the critics, who tried to find in it the result of the author's own experience, though it is rather a vivid dramatic conception, rare with Tennyson. "No modern poem," said Jowett, "contains more lines that ring in the ears of men." The same volume contained the popular "Brook" and "The

Charge of the Light Brigade." Returning to Arthurian legend, Tennyson published in 1859 four of the *Idylls of the King;* others were added in 1869, and in 1872 they were arranged in sequence, with a completion in "Balin and Balan" (1885). Though his conception of the Arthurian romances has been severely criticised, the *Idylls* are probably his highest achievement. *Enoch Arden* (1864) was the most immediately popular of all his volumes; sixty thousand copies were sold, and the title poem was translated into eight languages. From the epic Tennyson turned to the drama, producing *Queen Mary* (1875), *Harold* (1876), and *Becket* (1884). Besides these magnificent historical pieces are *The Falcon* (1879), *The Cup* (1881), *The Promise of May* (1882), and *The Foresters* (1892), of which *The Cup* was the most successful as an acting play. Tennyson's productive imagination continued active throughout his last years. His last volumes were *Ballads and Other Poems* (1880), containing "Rizpah" and "The Northern Cobbler;" *Tiresias and Other Poems* (1885); *Demeter and Other Poems* (1889), containing "Crossing the Bar;" and the posthumous *Death of Œnone and Other Poems* (1892).

In 1884, after some hesitation, the poet accepted a peerage. He died at Aldworth October 6, 1892, and was buried in Westminster Abbey.

No English poet has produced masterpieces in so many different kinds as Tennyson; and he is the supremely representative figure in literature of the Victorian era, because he touched and reconciled a greater number of its diverse interests than any other writer. Yet he is in constant protest against the individualism which that period inherited from the Romantic revival. The most salient feature of his mental attitude is his sense of law; it is the 'reign of law' as shown by modern science which most attracts him to scientific subjects. The consummate artistic excellence of his verse, resembling in many of its qualities that of Vergil, gives him an abiding place in literature. No better example exists in English of the 'eclectic' style made up of elements inherited from many of his great predecessors, emulating "by turns the sweet felicity of Keats, the tender simplicity of Wordsworth, the straightforward vigor of Burns, the elusive melody and dreamlike magic of Coleridge, the stormy sweep of Byron, the large majesty of Milton;" and he expressed, with such an instrument, a teaching which was uniformly pure, noble, and consoling.

BIBLIOGRAPHY. The authorized life of Tennyson is the *Memoir* by his son Hallam (London, 1897). The standard editions of the works as revised by the author are the *Cabinet Edition* (ib., 1898) and the one-volume *Globe Edition* (ib., 1898). Books devoted to the study of his poetry are numerous. Consult particularly Stopford Brooke, *Tennyson, His Art and Relation to Modern Life* (London, 1894); Van Dyke, *The Poetry of Tennyson* (New York, 1889; 10th ed., revised, 1898); Sneath, *The Mind of Tennyson* (ib., 1900); Stedman, in *Victorian Poets* (revised ed., ib., 1887); Frederic Harrison, *Tennyson, Ruskin, and Mill* (London, 1899), corrected in some particulars by Andrew Lang, *Alfred Tennyson* (New York, 1901); Collins, *Illustrations of Tennyson* (London, 1891); Anne Thackeray Ritchie, *Records* (ib., 1892); id., *Tennyson and His Friends* (ib., 1893); Gwynn, *A Critical Study of Tennyson* (ib., 1899); Luce, *Hand-book to Tennyson's Works* (New York, 1896); Dixon, *A Tennyson Primer* (ib., 1896); Napier, *The Homes and Haunts of Tennyson* (London, 1892); Rawnsley, *Memories of the Tennysons* (Glasgow, 1900); Masterman, *Tennyson as a Religious Teacher* (London, 1900); Collins, *The Early Poems of Tennyson*, with bibliography and various readings (ib., 1900); Maccallum, *Tennyson's Idylls of the King and the Arthurian Story* (New York, 1894); Bradley, *Commentary on In Memoriam* (London, 1901); Lyall, *Tennyson*, in "English Men of Letters" series (New York, 1902); Brightwell, *Concordance* (London, 1869); Shepherd, *Bibliography* (ib., 1896).

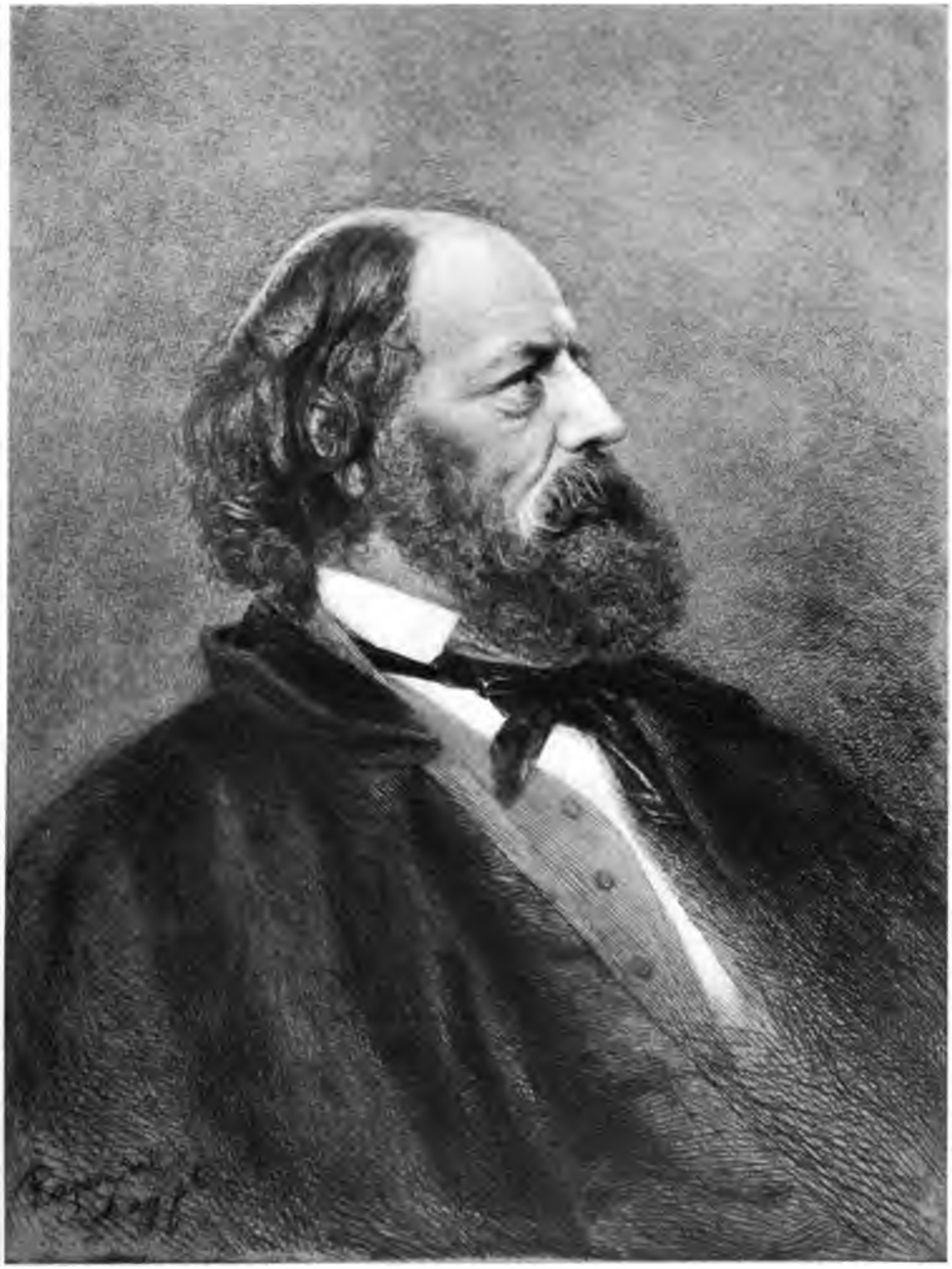
TENNYSON, CHARLES. See TURNER, CHARLES TENNYSON.

TENNYSON, FREDERICK (1807-98). An English poet, brother to Alfred Tennyson (q.v.), born at Louth, in Lincolnshire. In 1827 he left Eton, as captain of the school, and went up to Trinity College, Cambridge, where he graduated in 1832. He passed most of his time for many years on the Continent, living for a long period at Florence. In 1859 he settled in the Isle of Jersey, where he remained until 1896. He then removed to Kensington, where he died. With his brothers, Alfred and Charles, Frederick wrote verse before his college days. To their *Poems by Two Brothers* (1827) he contributed four poems. In 1854 he published *Days and Hours*, which contained several beautiful and noble lyrics. He published no more until 1890, when appeared *The Isles of Greece*. This volume was followed by *Daphne and Other Poems* (1891) and *Poems of the Day and Year* (1895), in part a reprint of *Days and Hours*. Quoting the sonnet on "Poetic Happiness," Alfred Tennyson said that his brother's poems "were organ-tones echoing among the mountains."

TENNYSON, HALLAM, second Baron Tennyson (1852—). Eldest son of the poet Alfred, Lord Tennyson (q.v.). He was born at Twickenham. He was educated at Marlborough School, and at Trinity College, Cambridge, and studied law at the Inner Temple. To the *Contemporary Review* for November, 1876, he contributed a translation of the Old English song of *Brunanburh*, which was afterwards turned into verse by his father. In 1880 he edited, with an introduction, the sonnets and lyrics of his uncle Charles Tennyson Turner (q.v.); and in 1897 he published the authorized life of his father, under the title *Alfred Lord Tennyson, a Memoir*. He was made Governor of South Australia in 1899. In 1902 he became Governor-General of the Australian Commonwealth, but resigned in the following year.

TENOCHTITLAN, tā-nŏch'tēt-län'. The ancient capital of the Aztecs, occupying the site of the present City of Mexico (q.v.).

TENOR (OF. *tenour, teneur*, from ML. *tenor*, chief melody, highest male voice to which this was assigned, Lat. *tenor*, a holding, tone, accent, from *tenere*, to hold, retain). In music, one of the four classes into which voices are divided in respect to their compass. It is the higher adult male voice, with an appropriate range from c to a^1. Music for tenor voices is generally written in the treble clef, or an octave higher than its true pitch. The sign of the C clef is also often



TENNYSON
FROM AN ETCHING BY PAUL RAJON

used, but it is not placed on the second *line*, but second *space*, so that the music is read as in the treble clef, but an octave lower. Two classes of tenors can be distinctly recognized, the heroic and lyric tenors (*tenore robusto*, *tenore di grazia*). The heroic tenors have something of the sonorous quality of the barytone in the lower register.

TE'NOS, or **TINOS**, tē'nŏs. An island in the Ægean Sea belonging to the Cyclades (q.v.) (Map: Greece, G 4). It has an uneven surface and covers an area of 79 square miles. On the south coast is the little town of the same name, called also Hagios Nikolaos (Saint Nicholas). It is on the site of the ancient town of Tenos, the remains of whose Temple of Poseidon were laid bare in 1902. The chief industries are wine-making and marble-quarrying. Population of the island, about 12,000. Tenos played an active part in the struggle between the Greeks and Persians, as well as in the Greek Revolution of 1821-27.

TENOT'OMY (from Gk. *τένων*, *tenōn*, tendon, from *τείνειν*, *teinein*, to stretch, strain + *τομή*, *tomē*, a cutting, from *τέμνειν*, *temnein*, to cut). The division of a tendon; a surgical procedure which usually has for its object the relief of some variety of deformity by severing a permanently contracted muscle at its tendinous portion. The affections in which tenotomy is most frequently found useful are club-foot (q.v.), contractions of the extremities following paralysis, deformity from contraction of the palmar fascia, wry-neck (q.v.), ankylosis of the points, and strabismus (q.v.).

TENREC (Malagasy name). An insectivore of the African family Centetidæ. Of the seven genera and many species, the best known is the tenrec (also spelled 'tendrac' and 'tanrec'), which is about a foot long, and owes its specific name (*Centetes ecaudatus*) to having no tail. Its hairs are rather spiny, but actual spines appear only in the young, which have three lines of them along the back, shed at the time of the arrival of the permanent teeth. The tenrecs are nocturnal animals, natives of Madagascar and the Mascarene isles. Three other species exist. They feed mainly on earthworms, æstivate during the hot season, and produce many young, sometimes more than 20. The flesh is edible, and the animal is so useful in the destruction of worms and insects that it has been introduced into Mauritius and Bourbon. See Plate of PORCUPINES AND HEDGEHOGS.

TENSE. In grammar (q.v.), the change in the form of a verb which marks the time of the action. See CONJUGATION; VERB.

TENSKWATAWA, tĕn-skwä'tȧ-wȧ, or **ELKSWATAWA**, ĕlk-swä'tȧ-wȧ (The Open Door) (c.1775-1834). A Shawnee prophet, younger brother of Tecumseh (q.v.). He attracted no special notice in his tribe until November, 1805, when, at the ancient town of Wapakoneta, in what is now northwestern Ohio, he made public proclamation of a vision during a recent trance, in which he claimed to have been taken up to the spirit world and to have received there a revelation from the God of the Indians, by which they were commanded to return to their primitive condition and customs. In a short time his followers were numbered by the thousands throughout the region of the Ohio Valley and the upper lakes. He was believed to be the living incarnation of Manabozho (q.v.), the great culture god of the Algonquian race. In the spring of 1808 he removed, together with his brother, from Greenville, Ohio, to a more central location on the Wabash just below the entrance of the Tippecanoe, the new settlement being familiarly known as 'Prophet's Town.' Here the prophet continued to preach, but the battle of Tippecanoe, November 7, 1811, broke his power and prestige. His followers scattered to their tribes until again summoned to battle by the English. Everywhere denounced as a liar and deceiver, he finally found refuge with the Wyandot. On the outbreak of the War of 1812 he crossed over into Canada, but returned when peace was declared and rejoined his tribe in Ohio, removing with them to the West in 1827.

TENT. A portable structure of canvas, skin, rugs, or other fabrics, designed for shelter. Animal skins and foliage doubtless formed the earliest coverings, for which textile fabrics were substituted as civilization advanced. In the Book of Genesis the patriarchs are represented as dwelling in tents, probably much the same as the modern Arab tents, large structures, rude in form, of small height, but covering a considerable space of ground. The early Greek and Macedonian military tents were small coverings of skin, each tent sheltering two soldiers. The Romans used two sorts of tents, one of canvas, constructed with two upright poles and a ridge pole between them, a type similar to the camping tent of to-day; the other resembling a light hut, a wooden skeleton, covered by bark, hides, mud, straw, or any other material which afforded warmth or protection. This latter type, it may be presumed, was only employed in the winter or for the more permanent camps. Each tent sheltered ten soldiers with their *decanus*. Possibly the tent has reached its highest perfection in Persia, where there are many tribes who dwell in tents. They are nearly hemispherical, over a wooden framework, and covered with felt, with worked hangings covering the entrance. The Chinese lower classes also live much in tents, and while their construction is invariably of matting, they are usually of great size and exceedingly comfortable in design. The modern military tents are made of linen or cotton canvas, and latterly since the discovery of khaki (q.v.), and its wide use in military uniforms, tents made of this material have been very largely employed both in England and in America. The largest military tents are those used for hospital purposes. They are oblong in shape with high side walls. The tent most commonly used in military camps usually is round, about twelve feet in diameter, and ten feet high, affording sleeping accommodation to about sixteen men. Many other forms are in occasional use throughout the world, some designed to cover one or two men and so constructed as to be easily carried by the men, others by baggage animals or mules. The 'dog tent' of the United States soldier is a small easily carried contrivance which affords a degree of shelter for one or two men. See ENCAMPMENT for description and illustration of a United States Army common wall tent.

TENTACULITES, tĕn'tăk-ŭ-lī'tēz (Neo-Lat. nom. pl., from *tentaculum*, tentacle, feeler, from

Lat. *tentare,* to touch, test, try). An important genus of fossil shells found in Silurian and Devonian rocks and often so abundant that they constitute the greater portion of thin limestone beds. The shells are of delicate, elongate conic form with the outer surface marked by regular transverse striations of either the same or alternate sizes, and also by very delicate longitudinal lines in the hollow between the striations. The species range from one-quarter to three inches in length. See Pteropoda.

TENT CATERPILLAR. The larvæ of four species of silk-spinning moths of the genus Malacosoma (formerly Clisiocampa). The female of the apple-tree tent caterpillar (*Malacosoma Americana*), a dull reddish brown moth with two oblique pale stripes on the fore wings, lays eggs in ring-like masses fastened to small twigs of apple, cherry, thorn, etc. The caterpillars hatch in the early spring in the nearest fork of the twigs, and spin a web or tent in which they live in company, but which they leave when hungry, to feed upon the surrounding leaves. The tent is enlarged as the creatures grow. They hibernate in the egg stage. The eggs are easily seen in the winter time and may be pruned and destroyed, and the caterpillars may be killed just at nightfall within the tents by burning or spraying with kerosene. The so-called forest tent caterpillar, or forest army-worm (*Malacosoma disstria*), has similar habits, but the ring of eggs is perfectly cylindrical instead of being rather elliptical as with the former species. Both of these species are of Eastern distribution. On the Western coast the larva of *Malacosoma constricta* infests fruit trees in the late summer, and the larva of *Malacosoma Californica* is found upon oaks early in the season.

TEN'TERDEN, Charles Abbott, first Baron (1762-1832). An English lawyer, born at Canterbury. Abbott graduated at Corpus Christi College, Oxford, in 1785, and soon afterwards was made a fellow. After being a student of the Inner Temple he was called to the bar in 1796. He joined the Oxford circuit, and rapidly acquired a lucrative practice. He published, in 1802, his treatise on *Merchant Ships and Seamen,* in all respects the best written book which had till then appeared on one department of English law and still a standard authority. In 1816 he accepted a puisne judgeship in the Court of Common Pleas; and in 1818 he was knighted, and chosen to succeed Lord Ellenborough as Chief Justice of the King's Bench. He was raised to the peerage in 1827 as Baron Tenterden of Hendon.

TEN THOUSAND, Retreat of the. See Anabasis and Xenophon.

TEN THOUSAND A YEAR. A novel by Samuel Warren (1841). The hero is a vulgar draper's clerk, Tittlebat Titmouse, who suddenly becomes rich through sharp legal practice.

TENURE (OF., Fr. *tenure,* from Lat. *tenere,* to hold, retain). The manner in which a person holds or owns real property. The word implies something less than an absolute and unqualified ownership. Before the development of the feudal system, an individual could own a piece of land absolutely, and such allegiance as he might owe to a superior power was a personal matter. However, at the very basis of the feudal system were the ideas of protection and service, of the dominion of the King and the dependence and subordination of the subject. Out of these ideas originated the feudal doctrine that the King should own all the land, and that his subjects were only entitled to hold such portions of it as he might parcel out to them, and on such conditions as he might impose. The Anglo-Saxons held their lands allodially, that is, by absolute and unqualified ownership; but when the Conqueror assumed the throne he parceled out the country among his followers as if it were his private estate, and introduced the intricate feudal *tenures* which had grown up on the Continent. See Feudalism.

With respect to their character and dignity, tenures under the feudal system in England may be classified as *free* and *base* or *non-free* tenures.

The most common of the free tenures was that by *knight's service,* which involved allegiance, military service, and other duties to the King or over-lord. This tenure was created by a solemn ceremony, in which the prospective tenant was said to pay *homage* to his lord, who thereby became bound to protect him in exchange for his promises of service and fealty. The chief service was performed by actual military duty when necessary, although at a later period a practice of making payments or sending substitutes, instead of the personal service, was sanctioned. Other heavy burdens incident to this tenure were known as *reliefs, aids, wardships,* and *marriage* (qq.v.), which yielded a large revenue to the great men of the realm.

Less common, but of greater dignity, was the tenure by grand sergeanty, which involved some personal service to the King, usually something other than military duty, as to be his cup-bearer, chief justice, standard-bearer, etc. *Petty sergeanty* did not usually involve personal service, but some tribute, such as rendering to the King annually a weapon, or a pair of spurs. See Grand Sergeanty.

Lands were frequently conveyed to the clergy on condition that they sing masses for the souls of the poor or distribute alms at certain intervals. This was known as tenure by *frankalmoign* or 'free alms.' In early times such land also remained subject to the burdens of feudal tenure.

As the rigor of the feudal system relaxed tenure by *socage* became the common and popular manner of holding land. See Socage.

Gavelkind, borough English, and *burgage* tenures were merely forms of socage tenure, changed somewhat by local custom. The Statute of Military Tenures in 1640 converted the military tenures into free and common socage.

During the Norman era there existed in England a large class of people known as *villeins,* who were practically serfs, and were generally attached to the land. They were given small plots to cultivate, and were required to perform the most menial services for the lord at his will. This was known as the tenure of *villeinage,* and was a base or non-free tenure. It became the custom, however, to note the succession of a son to his father, and the character of services performed by the latter, on the *rolls* or records of the Court Baron of the manor. By this custom the services required of villeins in each manor assumed a more certain and definite character, and they were said to hold by virtue of a 'copy of the rolls of the court.' At a later period the payment of rent in some form was substituted for menial services, and the *copyhold* tenant, as he came to be called, became a respectable member of the community. Many copyhold tenures still prevail, and the old practice of resorting to the 'custom of the manor' to ascertain their character or incidents still obtains.

In the United States most of the lands originally granted by the Crown and proprietors of 'plantations' were held in free and common socage, and a modified form of this tenure still obtains in a few States. In most of the States, however, all feudal tenures have been abolished and lands are held *allodially*, that is, absolutely and subject only to the right of eminent domain in the State. See Blackstone and Kent, *Commentaries;* Pollock and Maitland, *History of the English Law* (2d ed., Boston and London, 1899); *Encyclopædia of the Laws of England* (London, 1897-98); Degby, *History of the Law of Real Property* (2d ed., Oxford, 1884); Williams, *Real Property* (19th ed., London, 1902).

TENURE OF OFFICE ACT. A term sometimes applied to an act of Congress passed in 1820, chiefly through the influence of W. H. Crawford, Secretary of the Treasury, creating a four-year tenure for a large number of Federal offices, previously held by an indefinite tenure of good behavior. This act is usually regarded as having prepared the way for the introduction of the spoils system. The name Tenure of Office Act, however, is most commonly associated with the important act of 1867, which grew out of the controversy between Congress and President Johnson. It had been the practice from the establishment of the Government in 1789 to concede to the President the right to dismiss without the consent of the Senate all Federal officers appointed by him, inasmuch as the Constitution did not expressly require such consent, and in view of his sole responsibility for the execution of the laws. But on account of President Johnson's opposition to the Congressional policy of reconstruction it was feared by Congress that he would use his great power of dismissal to impede its plan of reconstruction, and accordingly the Tenure of Office Act was passed over his veto on March 2, 1867, providing that the consent of the Senate should be necessary to the dismissal of any officer appointed by and with the advice and consent of that body. Cabinet officials were also included in this. This was a complete reversal of the policy of the Government with regard to removals from office, and the President's disregard of the law in removing Secretary Stanton was the main cause of his impeachment by the House of Representatives. (See IMPEACHMENT.) With the accession of General Grant to the Presidency in 1869, the more objectionable features of the act were stricken out, and finally, in 1887, the act as a whole was repealed.

TENZON, or TENSON (Prov. *tenso*, from Lat. *tensio*, stretching, contention, from *tendere*, to stretch). In Provençal poetry, a debate in verse between two poets, and hence a special metrical form adopted for the purpose. See PROVENÇAL LITERATURE.

TEOCALLI, tā'ō-käl'yē (Nahuatl, house of the god). The ancient Mexican term for a temple and place of sacrifice and worship. The teocallis were commonly low, truncated, four-sided pyramids of earth, stone, or brick, a small temple building being placed on the flat summit. There was also as a rule a sacrificial stone on the summit, where public sacrifices were made. The term has come to be applied more specifically to the teocalli of the City of Mexico. This structure, as described by the early writers, had the usual pyramidal form, and was somewhat more than 80 feet high with a summit surface of 325 by 250 feet. This summit was reached by a terrace winding spirally five times around the pyramid. The great sacrificial stone from this teocalli is still preserved in the City of Mexico.

TE'OS (Lat., from Gk. Τέως). An ancient Ionian city on the west coast of Asia Minor; on a peninsula projecting into the Gulf of the Cayster, northwest of Ephesus. Here was a celebrated temple of Dionysus, and a theatre, of which remains still exist, while the walls of the modern town of Sigliajik contain many interesting inscribed stones from the ancient site. Teos was prosperous till the Persian conquest, when a large part of its inhabitants withdrew to their colony of Abdera in Thrace. It was the birthplace of the lyric poet Anacreon.

TEOSINTE (Mexican name), *Euchlæna Mexicana* or *Euchlæna luxurians*. A tall, stout, leafy plant closely related to and greatly resembling maize or Indian corn. It is a native of the warmer parts of Mexico and Central America, from whence it has been introduced as a forage crop. In its native habitat it grows rapidly, often attaining a height of 10 to 15 feet in a few months. The stalks bear 'tassels' of staminate flowers, and a number of small, flattened, poorly filled ears, the grain of which seldom matures farther north than the Gulf States. On account of its extensive tillering (30-50 stalks often springing from a single root) and its very leafy habit, teosinte produces as much green fodder upon a given area as any other grass. The Louisiana Experiment Station reports 50 tons of green forage per acre. The stalks are tender and the whole plant is readily eaten by stock. The plants may be cut several times during the season, but a single cutting just before the advent of autumn frosts will yield about as much forage as the more frequent cuttings. Teosinte withstands drought fairly well and has been successfully grown as far north as Kansas and Pennsylvania, but has not proved satisfactory at the experiment stations of Michigan, Vermont, Massachusetts, and Maine. An analysis of the green fodder shows it to contain water, 66.77 per cent.; ash, 3.97 per cent.; protein, 2.54 per cent.; fibre, 12.33; nitrogen-free extract, 13.60 per cent.; and fat, 0.79 per cent.

TEPEHUAN, tā'pā-hwän' (mountaineer, or conqueror). A brave and warlike tribe of Piman stock (q.v.) formerly occupying a considerable territory in the Sierra Madre. south of the Tarumari (q.v.), but now restricted to the mountainous region in the extreme northwestern portion of Durango, with adjoining portions of Chihuahua and Sinaloa, Mexico. In former times they were reputed the bravest people of Mexico. and they still are extremely jealous of their tribal rights. They are an industrious. agricultural people, living in houses of logs or stone set in clay mortar, or frequently utilizing the mountain caves for shelter. They cultivate cotton, which they weave into fabrics of beautiful texture and colors. They are now reduced to a mere remnant.

TEPIC, tȧ-pēk′. A territory in the western part of Mexico, bounded by the States of Sinaloa and Durango on the north, Jalisco on the east and south, and the Pacific on the west (Map: Mexico, G 7). Area, 11,275 square miles. The surface is low on the coast and mountainous toward the eastern frontier. The population, mostly semi-independent Indians, includes 30,000 Nayarits, engaged chiefly in agriculture. Population, in 1895, 147,776. Capital, Tepic (q.v.). The Nayarit population long resisted the Spanish sway and were not subdued until 1722, and then only nominally. In 1872 they rebelled against the Mexican Government, but were subdued after a bloody struggle. The Territory of Tepic was organized in 1889.

TEPIC. The capital of the Territory of Tepic, Mexico, 28 miles east of the port of San Blas, with which it is connected by a railway (Map: Mexico, F 7). Situated on a plateau 2900 feet above the sea, it commands a fine view of the Pacific; its climate, mild and healthful, attracts many summer residents from San Blas. The streets are straight and lined with well-constructed houses. It has cotton and cigar manufactures. It was founded in 1531 by Nuño de Guzmán. Population, in 1895, 14,560.

TEP′LITZ, or **TÖPLITZ**, tĕp′lĭts. A town of Bohemia, Austria, 46 miles northwest of Prague, in the valley of the Biela, between the Erzgebirge and the Mittelgebirge ranges (Map: Austria, C 1). It is a favorite watering-place, famous for its hot springs, which range in temperature from 97° to 120° F., and are almost free from mineral properties. The most important building is the Castle of Prince Clary, which, with its surrounding park and gardens, constitutes the chief resort of the town. Teplitz has important manufactures of buttons, cotton and india-rubber goods, chemicals, glass, pottery, and sugar. The springs have been celebrated since the eighth century. The town is known for the treaty of alliance signed here September 9, 1813, by the monarchs of Russia, Prussia, and Austria against Napoleon. Population, in 1900, 24,117.

TERAMO, tā′rȧ-mō. The capital of the Province of Teramo, Italy, 32 miles northwest of Chieti, at the confluence of the Tordino and Vazzola Rivers (Map: Italy, H 5). It lies amid attractive mountain scenery, and has interesting Roman remains. The fourteenth-century cathedral has been recently restored. The Church of Sant' Agostino is a handsome Gothic structure. Pottery, leather, fine furniture, straw hats, and cream of tartar are manufactured. The Gran Sasso d'Italia is often ascended from here. Population (commune), in 1901, 24,563.

TER′APHIM. A Hebrew word, plural in form but of obscure origin, and designating a certain kind of images used for oracular purposes. The teraphim appear to have been of various shapes, in some instances small enough to be hidden in the camel-litter—as in the story of Rachel's theft of the teraphim belonging to her father, Laban (Gen. xxxi. 19, 34), while in others they had a human form and were large enough to be used as a substitute for a man, as in the story of Michal's successful deception of her father, Saul, by placing a teraph in David's bed (I. Sam. xix. 13-16). The reverence paid to the teraphim as household deities lent a persistence to the practices connected with them that survived even Josiah's reform (II. Kings xxiii. 24), and we find teraphim in vogue during the exile (Zech. x. 2). Connected in some way with ancestor-worship, it is not unlikely that there is some relationship between teraphim and Rephaim (q.v.)—the 'shades' of the dead. Consult Schwally, *Das Leben nach dem Tode* (Giessen, 1892).

TER′ATOL′OGY. That portion of biological science which treats of the unusual or grotesque forms which the organs or the whole body may assume. See Malformation.

TERBIUM (Neo-Lat., from *Yt-terb-y*, in Sweden). A metallic element discovered by Mosander in 1843. It was originally found with erbia, yttria, and other rare earths, in the mineral gadolinite from Ytterby, Sweden, but its existence was subsequently disputed, until investigations by Cleve, about 1878, seemed to substantiate its elementary nature. It is, however, still doubtful whether terbium is a single substance or a mixture. The metal itself has never been isolated; its oxide is a dark-orange powder.

TERBORCH, tĕr′bōrk (ter Borch, Terburg), Gerard (1617-81). An eminent genre and portrait painter of the Dutch School. Born at Zwolle, he was first instructed by his father, a draughtsman and etcher of some ability, and went, in 1633, to Haarlem, where he became the pupil of Pieter de Molyn. In the selection of subjects he favored scenes of a peaceful and refined domestic life, occasionally disconcerted by the vicissitudes of love, the favorite theme of his pictures. Only exceptionally he descends into the lower strata of society, as for instance in his earliest picture preserved to us, the "Backgammon-Players," in the Kunsthalle at Bremen. The influence of the grand master of Haarlem, Frans Hals, is noticeable in his first dated picture, "Consultation" (1635, Berlin Museum). To the same period may be assigned the "Knife-Grinder's Family" (ib.) and "Boy with a Dog" (Pinakothek, Munich). In 1635 he went to London and is virtually lost sight of until 1645, when we find him painting portraits at Amsterdam. Thence he went to Münster, where he painted his most celebrated work, the "Peace Congress of Münster" (1648, National Gallery, London), containing sixty likenesses, perhaps the most perfect specimen of miniature portrait-painting. Accompanying the Spanish envoy to Madrid, he found much favor at Court and painted several portraits of Philip IV., by whom he was knighted. In 1650 he was back in Holland, where he married a widow, and settled at Deventer, in 1654. From about that period probably date the portraits of himself and wife in the Amsterdam Museum. A later full-figure portrait of himself is in the Hague Gallery, which also contains the charming picture known as "The Dispatch" (1665).

From 1650 to 1660 he painted most of those conversation pieces which have chiefly made Terborch's name popular, to wit: "The Reading Lesson" (c.1650), "An Offer of Money," and "The Concert" (all in the Louvre); "Paternal

Admonition" (c.1655, Amsterdam and Berlin); "Trumpeter Delivering Love-letter" (Munich); "Officer Writing Letter," and "Officer Reading Letter" (both in Dresden); and the "Guitar-Lesson" (National Gallery, London). All these have in common a forcible treatment of light and coloring, in which a pronounced lemon tint prevails beside a vigorous brownish red or deep scarlet. During the last two decades of his life his technique reached the height of its development. Minutely correct in drawing, rich and highly original in coloring, unsurpassed in the rendering of fabric, always harmonious and delicate in tone, the creations of his last period may well be ranked with those of the greatest colorists. They include: "The Music Lesson" (1660, Louvre), "Lute-Player" (in Antwerp, Cassel, and Dresden), "The Concert" (Berlin), "Lady Washing Her Hands" (Dresden), "Paring an Apple" (Vienna), and "The Letter" (Buckingham Palace, London), one of his most distinguished delineations. A striking example of fine modeling and masterly stuff-painting is "The Smoker," in the Berlin Museum, which also possesses four small full-length portraits of superior merit. His "Meeting of the Town Council" (1667, Town Hall, Deventer) ranks next to his Münster picture as regards the number of figures. In the Metropolitan Museum, New York, may be seen a portrait of himself and another portrait of a gentleman. Consult: Michel, *Terburg et sa famille* (Paris, 1888); Rosenberg, *Terborch und Jan Steen* (Leipzig, 1897); and Lemcke, in Dohme, *Kunst und Künstler*, ii. (ib., 1878).

TERCE. See BREVIARY.

TERCEIRA, tĕr-sā'ē-rȧ. The second largest island of the Azores (q.v.) (Map: Portugal, B 4). Area, 164 square miles. It is of volcanic origin. The coast is lined with precipitous cliffs of lava, and the diversified surface attains a maximum altitude of 3500 feet in Caldeira de Santa Barbara. Wine, lumber, and archil are produced and largely exported. Angra do Heroismo (q.v.), the chief town of the island, is also the seat of government for the entire group. The population of Terceira in 1900 was 56,548.

TER'EBRAT'ULA (Neo-Lat. nom. pl., diminutive of Lat. *terebratus*, p.p. of *terebrare*, to bore, pierce). A large number of fossil shells, chiefly in the Mesozoic formations, have been called Terebratula, but the name appears to be properly applicable only to certain species of the Mesozoic and Tertiary, which are closely allied to Terebratula Phillipsi of the Middle Jurassic. This group appeared in the Devonian, and, with a great expansion during the Mesozoic, it continues to the present day. As a rule the shells have a pentagonal or oval outline, with both valves convex, the ventral beak prominent and arching over the dorsal beak and perforated by a usually large foramen. The surface of the shell is always punctate, but in most species this character can be seen only with the aid of a lens. The earlier species are, as a rule, smooth-surfaced shells, while those of the Mesozoic are sometimes striated and in a few instances plicated.

TEREDO. The generic name of a small bivalve marine mollusk, colloquially called 'shipworm' and 'borer,' which perforates woodwork under water, especially ship's timbers and piling, devouring it and making long, shell-lined tunnels, many being crowded close together, and so weakening the timber that at last it breaks apart. See SHIPWORM.

TEREK, tĕr'ĕk. A river of Southeastern Russia, one of the chief streams flowing from the Caucasus (Map: Russia, G 6). It rises in a glacier near the summit of Mount Kazbec at an altitude of nearly 14,000 feet, and descends the north slope of the Caucasus in a tumultuous course through deep and narrow gorges. It then turns east, and after a total flow of 400 miles enters the Caspian Sea through a large delta. It carries down enormous quantities of detritus, and its delta is advancing into the sea at the rate of over 100 feet a year. The river is navigable 254 miles for small vessels.

TEREK. A territory in the eastern part of Northern Caucasia (see CAUCASUS), bordering on the Caspian Sea. Area, about 28,150 square miles (Map: Russia, F 6). It is bounded on the south by the Caucasus Mountains, many of whose highest peaks it contains. The interior is occupied to a large extent by the offshoots of the main chain and slopes toward the Terek and the coast, which is low and marshy. The region is watered by the Terek and its tributaries, and abounds in mountain lakes. In the lowlands along the coast and the Terek the climate is very unhealthful, and most of the settlements are found in the mountainous districts. Terek produces few minerals aside from petroleum, which is obtained in increasing quantities in the Grozny chain. At Pyatigorsk (q.v.) are the best known of the mineral springs. Agriculture gives occupation to about 80 per cent. of the inhabitants, but only a small portion of the cultivated land is utilized. The chief products are wheat, corn, rye, and hemp. The output of wine is extensive. The natives keep large herds of horses and sheep. Population, in 1897, 933,485. Capital, Vladikavkaz (q.v.).

TER'ENCE (PUBLIUS TERENTIUS AFER) (c.185-c.159 B.C.). A Roman writer of comedies. He was born at Carthage, and was perhaps of African (not Phœnician) origin. He was brought to Rome and there became the slave of the Roman senator Publius Terentius Lucanus, who, out of regard for his handsome person and unusual talents, gave him a good education, and finally manumitted him. On his manumission, he assumed his patron's *prænomen* and *nomen*. His first play was the *Andria*, which was put upon the stage in B.C. 166. Its success was immediate, and introduced its author to the most refined society of Rome, where his engaging address and accomplishments made him a particular favorite. His chief patrons were Lælius and the younger Scipio, after living with whom in great intimacy for some years in Rome he went to Greece, where he spent a year in studying the Greek comedies of Menander, Diphilus, Apollodorus, and others, and adapting them in Latin for the Roman stage. He never returned; and the accounts of how he came by his death are conflicting. He is supposed to have died by drowning in B.C. 159. Six comedies are extant under the name of Terentius, which are perhaps all he produced: *Andria*, *Hecyra*, *Heauton-timoroumenos*, *Eunuchus*, *Phormio*, and *Adelphi*. Terence preserved a sort of charmed life throughout the dark ages when classical literature was almost forgotten, and on the revival of letters was studied as a model by the most accomplished playwrights. His language is pure, almost immaculate, and though inferior to Plautus in comic power, he is more than his match in consistency of plot and character, in tenderness, in wit, and in metrical skill. The best editions are those of Wagner (Cambridge, 1869), Umpfenbach (Berlin, 1870), Dziatzko (Leipzig, 1884), and Fleckeisen (ib., 1901). There are good English translations by Colman (London, 1841) and Riley (New York, 1859).

TERENTIANUS MAURUS, tē-rĕn'shĭ-ā'nŭs ma̤'rŭs. A Roman poet referred with probability to the end of the second century A.D. His name indicates that he was an African, and he may be identical with the Terentianus, governor of Syene, praised by Martial (i., 87). There is an elegant poem extant by him on prosody and the various metres, *De Literis Syllabis, Pedibus, Metris.* It has been edited by Santen and Van Lennep (Utrecht, 1825), Lachmann (Berlin, 1836), and Gaisford (Oxford, 1855).

TERE'SA, Saint (1515-82). A famous Carmelite nun and mystical writer. She was born at Avila, in Old Castile. In her eighteenth year she entered a convent of the Carmelite Order in her native city, making her solemn vow on November 3, 1534. In this convent she continued to reside for nearly thirty years. After a time her religious exercises reached a most extraordinary degree of asceticism. She began her work of reforming the Carmelite Order in concert with a few zealous members of her own sisterhood in the Convent of Avila, but afterwards obtained permission from the Holy See, under the direction of Peter of Alcantara, to remove with her little community to Saint Joseph's, a small and very humble convent in the same city, where she established in its full rigor the ancient Carmelite rule, with some additional observances introduced by Teresa herself. This new convent was established in 1562. The general of the Carmelite Order, J. B. Rossi, was so struck with the condition of the convent over which Teresa presided that he urged upon her the duty of extending throughout the Order the reforms thus successfully initiated. Teresa entered upon the work with great energy, and succeeded in carrying out her reforms. (See Carmelites.) She died at Alba, October 4, 1582, and was canonized by Gregory XV. in 1622, her feast being fixed on October 15. The third centenary of her death was celebrated with great splendor in 1882. Her works consist, besides her famous letters, mainly of ascetical and mystical treatises. Complete editions in Spanish were published at Madrid in 1877 and 1881; an excellent French edition is that of Bouix (Paris, 1859). There are several biographies in English, by Mrs. Cunningham Graham (London, 1894); Whyte (1897); anonymous, with an introduction by Cardinal Manning (Dublin, 1872); the best is Coleridge, *Life and Letters of Saint Teresa* (London, 1881-96).

TEREUS, tē'rê-ŭs. See Philomela.

TERGOES, tĕr'gōōs'. A seaport of the Netherlands. See Goes.

TERGOVISTE, tĕr'gō-vĭsh'tê, or Targuvishtea. The capital city of the District of Dimbovitza, Rumania, 50 miles northwest of Bucharest, on the right bank of the Jalomitza (Map: Balkan Peninsula, E 2). As the former capital of Wallachia it had a population of 60,000, in the sixteenth century. The town is now an important strategic point. Population, in 1900, 9398.

TERHUNE, tĕr-hūn', Mary Virginia (Hawes) (1831—). An American novelist and journalist, born in Richmond, Va., of New England ancestry. She married in 1856 Rev. Edward P. Terhune of Brooklyn, was editorially connected with *Babyhood, Wide Awake, Saint Nicholas,* and *The Home-Maker*, and published under the name of 'Marion Harland' many domestic manuals, social essays, sketches of travel, novels, and short stories, among which may be noted: *Alone, A Tale of Southern Life and Manners* (1854); *The Hidden Path* (1855); *Moss-Side* (1857); *Miriam* (1860); *Nemesis* (1860); *Husks* (1863); *Sunnybank* (1866); *At Last* (1870); *Common Sense in the Household* (1871), one of her best known books; *Our Daughters, and What Shall We Do with Them?* (1880); *Sketches of European Travel* (1880); *Judith* (1883); and *A Gallant Fight* (1888).

TERLIZZI, tĕr-lĭt'sê. A town in the Province of Bari delle Puglie, Italy, 20 miles west by north of Bari and about 7 miles from the Adriatic (Map: Italy, L 6). It has an ancient castle. It is active commercially. Wine and almonds are leading products. Population (commune), in 1901, 23,232.

TERM (OF. *terme*, from Lat. *terminus*, OLat. *termo, termen*, boundary, limit). In the law of real property, the time during which a tenant is entitled to enjoy an estate, according to his lease. The word is also sometimes employed to denote the estate or interest of the tenant, itself.

TERM, of Court. In practice the word term denotes a period in which a court holds a session. Under the common law system in England the judicial year was divided into four terms, the names of which indicated the time of the year in which they were held, viz.: Hilary Term, Easter Term, Trinity Term, and Michaelmas Term. These terms were abolished by the Judicature Acts. In the United States the terms of court are arranged with reference to the number of judges available and the probable volume of judicial business to be disposed of. It is usual, however, to have a vacation of several months during the summer.

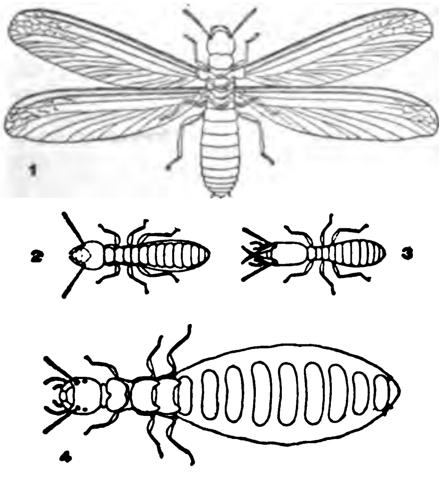
TERMINI IMERESE, tĕr'mê-nê ē'mâ-râ'zâ. A city on the north coast of Sicily in the Province of Palermo, on the San Leonardo, 21 miles east-southeast of Palermo (Map: Italy, H 9). The busy port is dominated by a plateau on which rise the houses of the well-to-do. In the rear are picturesque hills. Here also is the mediæval castle (now a prison), commanding a fine view. The Ospedale dei Benfratelli contains an historical museum with collections of Greek and Roman antiquities, and paintings by Sicilian artists. The city has a school of navigation and a library. There are extensive tunny and sardine fisheries. The exports include Sicilian macaroni (for which the town is famous), besides wine, olive oil, fruits, grain, and rice. The warm saline springs are much frequented for bathing. Population (commune), in 1881, 23,-

148; in 1901, 18,650. Termini Imerese, the Roman Termæ Himerenses, was founded by the Carthaginians in B.C. 407, after the destruction of the ancient Himera (q.v.), the ruins of which are still to be seen. It had become largely Hellenized when it was captured by the Romans in the First Punic War.

TER'MINUS (Lat., boundary, limit). A Roman divinity presiding over public and private boundaries. His only sanctuary was in the Temple of Jupiter, on the Capitol, where he was honored in the form of a boundary stone, above which was an opening in the roof, that his rites might be performed, as ritual required, in the open air. According to the divergent theories as to the Roman religion, Terminus may be regarded as an early god who later yielded to the growth of the worship of Jupiter, or as a later schematizing offshoot from the original conception of Jupiter as the guardian of all boundaries. The *Terminalia* seems to have been simply a festival of neighbors at their common boundary lines. We also hear of annual sacrifices at the frontier (real or assumed), but dedications to Terminus are unknown before the days of the Empire.

TERMITE (from Lat. *termes*, *tarmes*, woodworm; connected with *terere*, Gk. *τείρειν*, *teirein*, Lith. *triti*, *trinti*, OChurch Slav. *tryeti*, *trŭti*, to rub). Any one of the insects of the order Isoptera, comprising those forms known as white ants. They are not at all related to the true ants, but their general appearance and the fact that they live in societies have given them the popular name. For an account of the community life and of the different castes of the termites, see INSECT, paragraph on *Social Insects*.

The order Isoptera, which is most numerously represented in the tropics, includes only the single family Termitidæ, from which the common name 'termite' is derived. They undergo practically no transformation. The young when it hatches from the egg is an active, crawling creature with six legs, much resembling the adult except in size. All species are social, and the communities consist of both wingless and winged individuals. The males and females which are winged have very long membranous longitudinally veined wings which when in repose lie flat along the back, extending far beyond the tip of the abdomen. The hind wings are of nearly the same shape and size as the front wings, and across the base of each wing is a line of weakness indicating where the wing breaks off after the nuptial flight. The nests, which are often built of earth, are hard and persistent, and are sometimes more than 12 feet high. These 'ant-hills' are divided into chambers and galleries, and there are generally two or three roofs within the dome-shaped interior. The thick walls are perforated by passages leading to the nurseries and storehouses. Termites sometimes attack the woodwork of houses and soon reduce the thickest timbers to a mere shell. Those species which live in trees sometimes construct nests of great size, like sugar casks, of particles of gnawed wood cemented together and so strongly attached to the branches as not to be shaken down even by violent storms.



AMERICAN NORTHERN WHITE ANT (*Termes flavipes*).
1, adult male; 2, worker; 3, soldier; 4, supplementary queen. (After Marlatt.)

In the United States there are comparatively few species, and only one (*Termes flavipes*) which has a northward range. This is the common white ant found frequently living in the joists and other large timbers of houses. In these they make innumerable tunnels, running usually with the grain of the wood, so that, although a great deal of the substance of the wood is devoured, the main longitudinal fibres support the building structure for a long time. In fact, their presence in many houses would not be noticed except for the spring flight of the winged males and females. This species is probably native to North America, although it was accidentally introduced into Europe. A species known as *Termes tubiformans* occurs in Texas, and makes tubes around the grass stems and stems of other plants, while their nests are placed deep in the ground.

The origin of a new termite colony occurs after the nuptial flight when the female's (queen's) wings break off; her body swells with eggs, grows enormously, and egg-laying commences. Unlike the true ants or any of the other social Hymenoptera, the young require very little care from the workers. Just as with the true ants and other social insects, there are many termitophilous or guest insects to be found in the nests of termites. The damage done by termites in tropical regions is very great. In Central America it is almost impossible to erect wooden telegraph poles which will last for any length of time, as they are tunneled by these insects and fall very soon. Consult: Sharp, *Cambridge Natural History*, vol. v. (London, 1895); Howard, *The Insect Book* (New York, 1902).

TERN (Dan. *terna*, Icel. *þerna*, tern), or SEA-SWALLOW. One of a group, the Sterninæ, of small gulls (q.v.), found in most parts of the world, and essentially gulls in habits and appearance. About 75 species are known, varying in size from the Caspian tern (*Sterna tschegrava*), which is nearly two feet long and four and one-half feet across the wings, down to the dainty least tern (*Sterna antillarum*), which is only nine inches long. The typical color of the terns is blue-gray above, white beneath, and black on the crown, but one or two species are pure white, some are black and white, some sooty brown, and some almost wholly black. The 'common' tern is *Sterna hirundo*, abundant on the coasts of the whole Northern Hemisphere and of Africa. It breeds locally on the coast and in the Mississippi Valley from the Gulf States to Greenland, but, owing to incessant persecution, it selects only unoccupied sandy islets for its breeding places, and from New Jersey to Maine its only resorts now are Gull Island, N. Y., and Penikese and Muskeget Islands, Mass. The Arctic tern (*Sterna paradisœa*) is very similar. Its egg is illustrated on the Colored Plate of Eggs of American Game and Water Birds, and is typical of tern's eggs generally. The gull-billed tern (*Gelochelidon Nilotica*) of the Southern States, a cosmopolitan species; the roseate tern (*Sterna Dougalli*) of the Atlantic Coast; the sooty tern, or 'egg-bird,' of the West Indies (*Sterna fuliginosa*), also southern; and the elegant tern (*Sterna elegans*) of the Pacific Coast from California southward, are the most interesting among the 15 or 16 other North American species.

TERNATE, tĕr-nä'tȧ. A small but important island of the Moluccas, situated off the west coast of the island of Gilolo. Area, about 55 square miles. It consists of an active volcanic peak, rising 5400 feet above the sea. The chief town, Ternate, has a population of about 3000 and a good harbor, but is not of great commercial importance. It is the seat of the Sultan of Ternate, who has large dominions in Celebes, and is the capital of the Dutch Residency of Ternate, which embraces the northern Moluccas and parts of New Guinea and Celebes. See Moluccas.

TERNAUX-COMPANS, târ'nō' kôN'päN', Henri (1807-64). A French historian, bibliographer, and diplomatist, born in Paris. He is best known for his collection of books and manuscripts on the early history of America, one of the most remarkable ever brought together. Facilities for collecting it were increased by his diplomatic employment in Spain, Portugal, and Brazil. He was also once a member of the French Chamber of Deputies. He published a catalogue of Americana before 1700, *Bibliothèque américaine* (1836); also translations of documents in his collection in 20 volumes, *Voyages, relations et mémoires originaux pour servir à l'histoire de la découverte de l'Amérique* (2 series, 1836-40), and other works of less significance.

TERNAY, târ'nā', Charles Louis D'Arsac de (1722-80). A French naval officer, born at Ternay, in Normandy. He entered the navy in 1738 and fought at Louisburg in the French and Indian War. In 1762, in command of a squadron, he attacked Newfoundland, and captured Saint John's and several British vessels. He was governor of the island of Bourbon (1772-79). In 1780 he commanded the French fleet that brought over to America Count Rochambeau and his forces. He died at Newport soon after his arrival.

TERNI, tĕr'nê. A city in the Province of Perugia, Italy, 59 miles south by east of the city of Perugia, on the Nera River, near its confluence with the Velino (Map: Italy, G 5). The many Roman remains, including an amphitheatre, sculptures, baths, inscriptions, etc., are interesting. The city has a large Government arsenal and extensive iron and steel interests. Woolen goods, brick, olive oil, and wine are also manufactured. Near the city are the famous falls of Terni, in the Velino River—the Cascate delle Marmore—with a total descent of 650 feet. Population (commune), in 1901, 30,641. Terni, the ancient *Interamna*, was of considerable importance under the Romans.

TERN'STRŒMIA'CEÆ (Neo-Lat. nom. pl., from *Ternstrœmia*, named in honor of the Swedish naturalist *Ternström*). According to Bentham and Hooker, an order of about 200 species of dicotyledonous trees and shrubs, natives of warm and temperate countries. They are most abundant in South America; a few are found in North America; some in India and China. The leaves are alternate, leathery, in many species evergreen, generally undivided. The flowers are on axillary or terminal stalks, generally white, sometimes pink or red; the fruit a 2 to 7 celled capsule, containing a few large seeds, often rich in oil. This order contains tea, camellia, and gordonia (qq.v.). Engler divides it into several distinct orders, most of the genera being transferred to the order Theaceæ. The best known American representative of this order is the loblolly bay (*Gordonia lasianthus*).

TERPAN'DER (Lat., from Gk. Τέρπανδρος, *Terpandros*). A Greek musician who lived in the seventh century B.C. He was born at Antissa, in the island of Lesbos, went to Sparta, and in 676 was crowned victor in the first musical contest at the feast of Apollo Carneius. He established there the first musical school in Greece and is credited with the enlargement of the compass of the lyre to an octave. He was the first to set poetry regularly to music.

TERPSICHORE, tĕrp-sĭk'ô-rē (Lat., from Gk. Τερψιχόρη, fem. of τερψιχόρος, *terpsichoros*, delighting in the dance, from τέρψις, *terpsis*, enjoyment + χορός, *choros*, dance). In Greek mythology, one of the nine Muses (q.v.). She presided over the choral dance. In the later assignment of functions to the Muses, she was regarded as the Muse of the lesser lyric poetry, and was distinguished by the lyre.

TERQUEM, târ'käN', Olry (1782-1862). A French geometer, born at Metz of Jewish parents. In 1804 he was called to Mainz as professor of mathematics in the Lyceum, and afterwards to a similar position in the school of artillery. Returning to Paris in 1814, he was appointed librarian in the artillery depot at Saint-Thomas-d'Aquin. Terquem was a distinguished geometer and is largely known for his *Nouvelles annales de mathématiques*, a publication which he founded together with Gerono in 1842, and which is still continued. He also wrote *Bulletin de bibliographie, d'histoire et de biographie mathématiques* (7 vols., 1855-61).

TERRACE (OF. *terrace, terrasse*, Fr. *terrasse*, from It. *terraccia, terrazzo*, terrace, from *terra*, from Lat. *terra*, earth, land). In geology, a stretch of comparatively level land along the shore of a lake or the ocean or bordering the course of a river and elevated some distance above water level. Terraces frequently occur in series, one rising above the other as the distance from the shore increases. River terraces owe their origin to the cutting down of flood plains; as the channel of a river widens and deepens the flood plain is gradually cut away until only the edges adjacent to the valley walls remain. This process may be repeated several times, giving rise to a succession of terraces of which the oldest have the highest elevation and are farthest removed from the river. The drift terraces so common in the Northern States are remnants of flood plains that were formed when the overloaded streams of the Glacial period filled their preglacial valleys. Lake terraces mark former shore lines and are evidence of a shrinkage in the volume of the lakes. They are well marked around most of the Great Lakes, also on the shores of Lake Champlain and the lakes of the Great Basin. Their abundance has suggested the term 'Terrace epoch' to designate the geological period during which they were produced. See BEACHES, RAISED; LAKE; RIVER; LAKE AGASSIZ; etc.

TERRACINA, tĕr'rȧ-chē'nȧ. A city in the Province of Rome, Italy, 76 miles southeast of the city of Rome, on the Tyrrhenian Sea, and at the southern end of the Pontine Marshes (Map: Italy, H 6). The ancient city occupied a commanding position on the crest of a hill overlooking the modern site. This section affords a magnificent view and has interesting remains of the Roman period, notably those of the imposing Temple of Venus, which until 1894 were supposed to belong to a palace of Theodoric the Ostrogoth. The Cathedral San Cesareo in the modern city, occupying the site of another Roman temple, is of much architectural beauty. Population, in 1901, 11,310. Terracina, the Volscian *Anxur* and the Latin *Tarracina*, was of considerable military importance under the Romans.

TERRA COTTA (It., baked earth). Hard-fired earthenware, especially that which is used for architectural material.

GREECE. Terra cotta statuettes are one of the most common products of ancient art. They are found in considerable numbers in Egypt, from the earliest periods, though often here the clay is covered by a vitreous glaze forming the so-called Egyptian porcelain. Such figures are among the most charming and dainty products of Greek art. The archaic terra cottas are numerous, especially on sacred sites. The later figurines from the fourth century B.C. and the Hellenistic period have been found in tombs at many sites, but the earlier group is best represented by the statuettes from Tanagra in Bœotia, which are strongly influenced by the art of Praxiteles and his contemporaries. In the later period the characteristics of Hellenistic art are seen in terra cottas from Asia Minor (especially Myrina), Sicily, and Southern Italy. The attractiveness of these figures has led to many imitations, which frequently are so skillful that only the expert can detect their origin. The ancient figures were made in molds, sometimes as many as 16 being employed for a single figure; then after baking they were often retouched or engraved, and finally painted in brilliant colors on a coating of white lime. For architecture the pieces were finished in true ceramic painting, simple but of great excellence. In Central Italy, especially in Etruria and Latium, crude brick seems to have been largely employed, and hence terra cotta was used for decorative purposes in important buildings at a time when in Greek lands it had been largely supplanted by stone. In this region also terra cotta seems to have been used much more extensively for large figures than among the Greeks.

MIDDLE AGES AND RENAISSANCE. Throughout the Middle Ages, baked clay was used in architecture, chiefly for floor tiles, but also for roof-crestings and ornamental finials. In the great plain of North Germany, where stone was rare and fictile clay abundant, a whole school of Gothic architecture in brick grew up in the fourteenth century and continued for two hundred years; and the decorative reliefs modeled in clay and used as capitals, friezes, and the like, are of singular interest. Elaborate decorative gables and parapets were made of this material and baked so hard that they are terra cotta rather than brick. In Italy, at the time of the Early Renaissance, the material is used very freely in elaborate detail in churches and in private dwellings. The Renaissance artists used this material freely for sculpture, even for life-size busts, though rarely for statues. (See ROBBIA, DELLA.) Another epoch of art during which terra cotta was freely employed was of the eighteenth century, when, especially in France, terra cotta statuettes and groups were made in great abundance, and vases, clocks, and the like decorated by reliefs and figures in the round were made for decorative effect. The most famous masters of this art were three sculptors of the name of Adam (Lambert Sigisbert, and his brothers Nicholas Sébastien and François Gaspard), and especially Claude Michel, commonly known as Clodion.

NINETEENTH CENTURY. In the nineteenth century the use of terra cotta as a building material was resumed in connection with the Gothic revival and the increasing demand for decorative detail. Toward the close of the century some slight attempts were made to introduce polychromy of a permanent kind in connection with this material. Some of the best terra cotta for buildings is made in the United States; and here also color has been sparingly used. Among its advantages as a building material are the ease with which it may be molded to any desired architectural or sculptural form and indefinitely repeated, its durability, lightness, strength, and cheapness. It may be made in almost any desired color.

MANUFACTURE. A better grade of clay is required for terra cotta than for brick. Oftentimes clays from different localities must be mixed to secure the right color, while such vitrifying ingredients as pure white sand, old pottery or fire brick finely ground, and burned clay, are added to secure partial vitrification. After weathering, the selected clay is ground or washed (see CLAY, par. *Clay-Mining*), mixed with the vitrifying ingredients and water; next, the various sorts of clay are piled in layers. Vertical slices from this mass are taken to either a pug mill or rollers for tempering. The material is next sent to the molding room in cakes of convenient size. If only one piece is required, the clay may be modeled by hand, ready for baking; but if the design is to be repeated a model is made and a mold taken, into which the clay is forced by hand. After partial drying the product is turned over to the finisher, who may be more or less skilled, according to the character of the design. After drying, the forms are baked or burned, as described under KILN.

BIBLIOGRAPHY. Lecuyer, *Terres cuites* (Paris, 1882-85); Cherret, *Die Terrakotten* (Berlin, 1886); Pottier, *Les statuettes de terre cuite* (Paris, 1890). The Greek statuettes are well treated in Hutton, *Greek Terracotta Statuettes* (London, 1899), and less accurately though in more detail in Huish, *Greek Terracotta Statuettes* (ib., 1900). Of special value are: Kekulé, *Griechische Thonfiguren aus Tanagra* (Stuttgart, 1878). A catalogue of ancient terra cottas is in preparation by the Berlin Academy of Sciences under the editorial supervision of Kekulé, of which two volumes have appeared. The Etruscan funeral urns are collected by Brunn and Körte, *I rilievi delle urne etrusche* (Rome, 1870 et seq.). On the use of terra cotta in architecture consult: Dörpfeld, Gräber, Borrmann, and Siebold, *Ueber die Verwendung von Terrakotten am Geison und Dache griechischer Bauwerke* (Berlin, 1881). For application of ornamental terra cotta to buildings, consult Kidder, *Building Construction and Superintendence*, part i., "Mason's Work" (New York, 1896). For the manufacture of the various wall and floor fireproofing materials, roof coverings, and other clay goods often going under the name of terra cotta, also for porous terra cotta and terra cotta lumber, see BRICK; TILE. For the application of these materials, see FIREPROOF CONSTRUCTION.

TERRA DEL FUEGO, tĕr′rȧ dĕl fwā′gō. A corrupted form of Tierra del Fuego (q.v.).

TERRAMARE, tĕr′rȧ-mä′rȧ (from It. *terra amara*, bitter earth). The term applied to certain low mounds with level tops in the valley of the Po, which are supposed to have formed the foundations of pre-historic Italian villages. They occur only in marshy districts, and form a development of the lake-dwellings of Switzerland. Since about and above them much débris of the villages accumulated in the course of time, the terramare are of great archæological importance, and present, in this regard, certain analogues with the kitchen-middens of Denmark and the shell-heaps of America. In them are found fragments of bones, pottery, tools, implements of war, and the like, which cast light on the ancient civilization of Italy in the Neolithic period. See ITALY, section on *Ethnology;* KITCHEN-MIDDEN; LAKE-DWELLINGS.

TERRANOVA, tĕr′rȧ-nō′vȧ. A seaport in the Province of Caltanissetta, Sicily, 75 miles east by south of Girgenti (Map: Italy, J 10). There are tunny and sardine fisheries, and manufactures of woolen goods. The exports are grain, wine, sulphur, soda, and cotton. Terranova was built by Frederick II. in the thirteenth century on the site of Gela (q.v.). The ruins of the ancient necropolis have yielded numerous vases. Population (commune), in 1901, 22,114.

TERRAPIN (probably of North American Indian origin). Any of several species of fresh-water or brackish water or 'mud turtles' of the family Emyidæ, natives of tropical and the warmer temperate countries. The neck can be wholly retracted within the shell; the head is flat, and the jaws prolonged into a beak. Terrapin feed partly on vegetable food, but also devour fish, reptiles, and other aquatic animals. They swim very well, and even on land move with much greater swiftness than land-tortoises. The family is represented in the United States by about twenty species. The word terrapin has no exact scientific significance, but in the United States it is more commonly applied to the diamond-back terrapin (*Malaclemmys centrata*). This species is found in salt marshes from New York to Texas, and is gray with black markings. Its flesh is highly esteemed as a table delicacy, and in some places along the southern coast these turtles are reared for market in inclosures in large numbers.

EDIBLE TERRAPIN, OR DIAMOND-BACK.

TERRE, tĕr, LA (Fr., the Earth). One of Zola's Rougon-Macquart novels (1887), in which the author presents a brutally realistic study of peasant life.

TERRE HAUTE, tĕr′*e* hōt′. The county-seat of Vigo County, Ind., 72 miles west by south of Indianapolis; on the Wabash River, and on the Cleveland, Cincinnati, Chicago and Saint Louis, the Evansville and Terre Haute, the Terre Haute and Indianapolis, the Southern Indiana, and other railroads (Map: Indiana, B 3). It occupies an elevated site, and is regularly laid out. Terre Haute is the seat of the Rose Polytechnic Institute, Indiana State Normal School, and Saint Mary's Institute. Other noteworthy institutions include the Rose Orphans' Home, Saint Ann's Orphans' Home, Saint Anthony's Hospital, Union Hospital, and Rose Dispensary. The United States custom-house and the county court-house are also prominent structures. There is a public library with about 30,000 volumes. Terre Haute carries on considerable trade, being the centre of a productive section, largely devoted to agriculture and containing valuable coal deposits. It is also an important industrial city. The various manufactures in the census year 1900 had $8,938,107 capital and a production valued at $27,784,619. Of the latter amount, more than half was accredited to the concerns engaged in the distillation of liquors. There are also foundries and machine shops, flour and hominy mills, clothing factories, rolling mills, slaughtering and meat-packing establishments, car works, a brewery, planing mills, and manufactures of carriages, glass, electric motors, stoves, brick, tools, wheels, etc. The government, under the charter of 1902, is vested in a mayor, chosen biennially, and a unicameral council. The subordinate officials, with the exception of the school board, which is elected by the council, are appointed by the mayor. For maintenance and operation the city spends annually about $401,000, the principal items being: schools, $139,000; fire department, $40,000; police department, $30,000; municipal lighting, $27,000; streets, $22,000; and interest on debt, $21,000. Population, in 1890, 30,217; in 1900, 36,673. Terre Haute was founded in 1816 and was chartered as a city in 1833.

TER′RELL. A city in Kaufman County, Texas, 32 miles east of Dallas; on the Texas and Pacific and the Texas Midland railroads (Map: Texas, F 3). It is the seat of the North Texas Hospital for the Insane. It is the commercial centre of a section engaged in farming, cotton-growing, and fruit-growing, and having besides important cattle-raising and lumber interests. It is also of some prominence as an industrial city, being known for the manufacture of cottonseed oil. It has shops of the Texas Midland Railroad, cotton gins, a cotton compress, a flour mill, a foundry, a canning factory, etc. The government is vested in a mayor, elected every two years, and a unicameral council. The waterworks are owned by the municipality. Population, in 1890, 2988; in 1900, 6330.

TERRESTRIAL MAGNETISM. See MAGNETISM, TERRESTRIAL.

TERRIER (OF. *terrier*, from ML. *terrarius*, relating to the earth, from Lat. *terra*, earth, land, so called from its habit of scratching the ground in pursuit of its prey). A small active domestic dog, used in pursuit of vermin. Sixteen distinct breeds of this dog are officially recognized, several of which have two sub-varieties, i.e. rough-haired and smooth. The earliest authentic mention of the terrier is by Dr. Caius, who wrote a Latin treatise on the dog before 1572. He enumerates among the British dogs 'the terrare,' which he described as used to hunt the fox and badger by following them underground. Strutt describes good terriers in the time of James I. (1603-25). This breed was what is now called a fox-terrier, but at that time was black and tan, or pied with white or yellow, of which a large and a small variety were bred. The larger variety became a rough-haired, strong animal, the foundation stock of the English white terrier. This breed, crossed with the bulldog, produced the bull-terrier, a dog of infinite courage, out of which, however, all other bulldog characteristics have been eliminated. The fox-terrier was gradually degraded into a fighting dog, and so lost caste that it became nearly extinct, but was revived about 1865, and became the most popular of all terriers as a pet in the house as well as a useful servant about the stable. While in one direction all the color was being bred out of the original terrier to produce the 'white' dog, so in another direction all the white was being eliminated to produce the pure black-and-tan, until that race was perfected. From the smaller specimens of this breed came, by selection, the toy black-and-tan weighing as little as three pounds. The Welsh terrier is a large wire-haired black-and-tan; and the Irish terrier is a wire-haired yellow variety, claimed to be indigenous and of the highest antiquity. The Bedlington is a wire-haired variety supposed to be a cross between the low-legged, wire-haired Dandie Dinmont and the otter-hound, but it much more strikingly resembles the Irish water dog. The Airedale is a cross of the rough-haired English terrier with the otter-hound; and the Boston terrier is a cross of a smooth-coated terrier with the bulldog.

In contrast to the above group of long-legged, short-bodied, up-standing dogs, with either rough or smooth coats, are the long-bodied, short-legged dogs, with a long and silky covering. This latter group were originally developed in Northern Scotland. They are the Scotch, a rough wire-haired variety; the Dandie Dinmont with a woolier coat; and the Skyes and Clydesdales with long silky coats. The Yorkshire is the only English specimen of the low-bodied, silky-haired terrier. Japan boasts the shan-tung, which is almost indistinguishable from the Skye; and the Maltese terrier, named from the island, has a coat as long and silky as a Blenheim spaniel.

The characteristics of standard varieties are as follows: *Fox-terriers.* Generally gay, lively, and of active appearance, with bone and strength in a small compass, capable of speed and endurance, and weighing about 20 pounds. The head must be broad between the ears and decreasing in width to the eyes; nose tapering and black; ears V-shaped and drooping forward close to the cheek; jaws strong and muscular; legs straight and strong. The coat of the smooth variety is flat and abundant; of the wire-haired variety it is hard, wiry, and broken. The tail, which is usually docked, is set on high and carried gaily, but not over the back. *The bull terrier* is a short-haired terrier, weighing from 15 to 50 pounds, of perfect symmetry, the embodiment of agility, grace, and determination. An all-white coat is most approved, but the American standard permits markings. The tail is left uncropped; in America cropping of the ears is permitted by the standard, but not in England. *The black-and-tan* is judged in three classes not exceeding 7 pounds, 16 pounds, and 20 pounds respectively. He is a typical terrier, jet black, marked with rich mahogany tan as follows: On the head the muzzle must be tanned to the nose, which is black; a bright spot of tan on each cheek, and above each eye; chin, throat, and inside of the ears, and the fore legs up to the knees are tan-color, with black lines up each toe, and a black 'thumb mark' above the foot inside the hind legs. *The Welsh terrier* is a wire-haired variety, black or grizzle and tan in color. The dogs are 15 inches high at the shoulder and 20 pounds in weight. *The Irish terrier* is a wire-haired variety, whole-colored, bright red or wheaten yellow, weighing 24 pounds, active, lively, and lithe—a gamy dog, but with the kindest disposition. *The Bedlington* is a rough-looking, loosely built dog, with the least general expression of the true terrier. He is 15 to 16 inches high and weighs 24 pounds. His coat is shaggy and usually dark blue. *The Airedale*, the latest and largest variety of the family, weighing 40 to 45 pounds, is a wire-haired dog, with the crown, back, and sides black, and the face, throat, and limbs tan; the tail is docked, and the aspect square, trim, and powerful. *The Boston terrier* is purely a pet dog of recent creation, which is as much bulldog as terrier, but has lost the wrinkled face and bowed legs of the former, while retaining its brindled markings and screw tail. It weighs 15 to 30 pounds, and is judged in two classes, large and small. *The Scottish terrier* is a long-barreled, bow-legged, rough-haired dog, weighing from 18 to 20 pounds, with prick ears, and tail carried straight up. This dog has a very sharp, bright, and active expression. His coat is intensely hard and wiry, dense all over his body, and iron-gray, grizzly, or black in color, though sometimes sandy. His feet are large, with strong claws, and he is most capable in unearthing vermin. *The Dandie Dinmont* is from 8 to 11 inches high, weighs from 14 to 24 pounds, and has a mixed coat of hard and soft hair, and a salt-and-pepper color. His ears are long and pendulous. *The Skye terrier*, a good vermin dog, and built low and long (from 8½ to 10 inches high and 22½ inches long), has two coats, the under one short, close, soft, and woolly, the top one 5½ inches long, hard, straight, flat, and free from crisp or curl. The ears and tail are feathered with long soft hair and the tail is never carried higher than the line of the back. In color it is usually a light blue, gray, or fawn. *The Clydesdale*, or *Paisley*, is practically a little Skye with smaller ears, set high and perfectly erect. It is covered with long silky hair, hanging in a fringe down the side of the head. *The Yorkshire* is also practically a smaller Skye, with a more silky coat. He is judged in two classes, one under five pounds and another from 5 to 12 pounds. *The Maltese* was the lap-dog of the Greeks and Romans of the classic period. He is a small, short-legged dog, not exceeding six pounds in weight, with pure white, rather transparent wavy hair, not less than seven inches long. It is called 'terrier' by its devotees, but it might as reasonably be called a spaniel or toy dog. It has almost if not entirely disappeared from Malta.

Consult authorities cited under Dog; and see Plates accompanying that article.

TERRITORIAL WATERS. Waters subject to the jurisdiction of a particular State, as opposed to the high or open seas, which are free to all nations. Territorial waters comprise: First, inclosed waters, such as (a) lakes, rivers, and other inland waters wholly within the confines of a State; (b) lakes or rivers forming the boundary of a State, in which the control of the riparian States, in the absence of exclusive title vested in one of them, extends to the middle of the stream in the case of non-navigable rivers and in navigable rivers to the middle of the deepest channel, boundary lakes being governed by the same rules; (c) bays, straits, sounds, or arms of the sea within headlands belonging to the same State not exceeding two marine leagues apart. Second, uninclosed waters or the open sea to the distance of one marine league outward from low water mark. The status of straits, gulfs, and bays whose central waters lie more than a marine league from any shore and gulfs and bays having a narrow entrance, but broad in extent and reaching far into the land, is not yet clearly defined. They are sometimes claimed as jurisdictional waters, though little occasion has arisen in modern times for the assertion of the claim. To this class belong the bay of Conception in Newfoundland; Delaware Bay, which the United States declared territorial water in 1793; and the 'King's Chambers,' as the waters lying between the headlands of Orfordness and the Foreland were called.

The law relating to inclosed waters is settled. The State within whose territory they lie has title and dominion as well as jurisdiction over them. The title to the land under water and to the shore below high-water mark in navigable lakes and rivers in the United States and ports, harbors, bays, straits, sounds, or arms of the sea is vested in the particular States bounding thereon for the public use and benefit unless otherwise disposed of by such sovereign power, but always subject to the constitutional prerogative of the Federal Government of regulating interstate and foreign commerce thereon. In England and States adopting the common-law principle, these rules apply only to tide waters, all other navigable streams being subject to riparian ownership. (See Tide Waters.) Although the sovereignty to which the waters belong has exclusive jurisdiction both civil and criminal over its inclosed waters, a concurrent jurisdiction is sometimes given by usage or treaty to the State of ownership over criminal acts committed on foreign vessels in such waters where its authority is not invoked and where the parties are exclusively foreign and no breach of the peace is committed. Where territorial waters form a channel of communication between two portions of the high sea, the right of innocent passage exists to both the merchant and naval vessels of States at peace with the territorial power, subject to the observance of reasonable regulations relating thereto. Navigation of the Dardanelles and the Bosporus by non-Turkish vessels is, however, not regulated by the rules of international law, but is the subject of special treaties between the powers. By the convention of October 29, 1888, the Suez Canal was made neutral to all nations.

The law relating to the uninclosed waters is not so clearly defined. While claims to dominion over whole seas have vanished from international law, the last assertion being that of the United States to control over Bering Sea (see Bering Sea Controversy) for the protection of the seal fisheries, yet the process of departure has left behind a remnant of claims to territorial power over considerable stretches of water along the coasts of maritime States, though it is doubtful just how far some of these are alive at the present time.

The nature of the sovereignty does not include ownership, but is a right of jurisdiction limited to the protection of its coasts from the effect of hostilities between other belligerent States, the prevention of frauds upon its customs laws, the regulation of fisheries therein, and the usufructory right to such fisheries. The valid exercise of these prescribed rights is limited to a marine league from low-water mark, and except to secure these, it may not make laws or interfere with the travel of ships over these waters. Apparent exceptions to this rule are sometimes cited in the case of regulations requiring ships entering territorial waters to take on board a pilot at a greater distance than a league from the coast and imposing a penalty for failure to comply with such requirements and customs laws and Hovering Acts authorizing municipal seizures beyond a marine league. Of the latter class are the British acts of 1736 and 1784, asserting jurisdiction for revenue purposes to a distance of four leagues and those of the United States in 1797, 1799, and 1807, to the same effect. Many other maritime nations have similar provisions in their laws. There is some doubt, however, whether the right to make such seizure for violation of customs acts could now be maintained against the remonstrance of a foreign State. See Mare Clausum; High Seas.

TERRITORIES (OF. *territorie*, Fr. *territoire*, from Lat. *territorium*, district, from *terra*, earth, land). The name given in the United States to certain parts of the national domain which have not been erected into States. In 1903 they were Arizona, New Mexico, Oklahoma, the Indian Territory, the District of Columbia, and Alaska on the Continent, Porto Rico in the West Indies, and Hawaii, the Samoan Islands, Guam, and the Philippine Islands in the Pacific, aggregating a total area of about 962,630 square miles. They may be classified as (1) organized Territories; (2) unorganized Territories; (3) the Federal District; and (4) the insular possessions. In the first class belong Arizona, New Mexico, and Oklahoma. To the second belong the Indian Territory and Alaska. The organized Territories and Hawaii among the insular possessions have popularly elected local legislatures of two chambers chosen for a term of two years by a suffrage determined by local law. This legislative power extends to all rightful subjects not inconsistent with the Constitution and laws of the United States, but any law passed is subject to the veto of Congress. The executive power is vested in Governors appointed for a term of four years by the President of the United States with the consent of the Senate. In the organized Territories there is a series of courts of which the higher ones are held by judges appointed for a term of four years by the President. These courts are not, however, a part of the Federal judiciary. The other important officers of the Territory are likewise appointed by the President and are paid from the Treasury of the United States. The Governors and judges of the Supreme Court receive $3000 a year. The Territories are not regularly represented in Congress, but are allowed to send a delegate, who is given a seat in the House of Representatives with a right to take part in the debates, but not to vote. For the government of Alaska, the Indian Territory, the District of Columbia, Porto Rico, the Samoan Islands, and the Philippine Islands, see these titles.

By the United States Constitution the National Congress is given power "to make all needful rules and regulations respecting the territory or other property belonging to the United States." From the beginning this clause was construed as giving the powers incident to jurisdiction as well as to ownership, and even before the adoption of the Constitution the Northwest Territory was regularly organized by the old Confederation Congress, which for this purpose passed the famous Ordinance of 1787. (See NORTHWEST TERRITORY.) This ordinance served as the model for much of the subsequent legislation in the same field, though there were a number of important variations. Thus, in the organization of the Territories of Tennessee and Mississippi the clause of the Ordinance of 1787 prohibiting slavery was omitted. Of the present States of the United States all, except the original thirteen and Vermont, Maine, Kentucky, West Virginia, Texas, and California, have passed through the Territorial stage. Vermont, Kentucky, Maine, and West Virginia were each formed out of territory which belonged to one of the original thirteen States, and Texas and California were regularly admitted to Statehood without ever having been organized as Territories. The size of many of the Territories, however, differed widely from the size of the States which bear the same names, and there has been a radical changing of boundaries. Thus the Territory of Mississippi originally included Alabama; the Territory of Indiana as organized in 1804 contained all of the Northwest Territory except Ohio; the Territory of Illinois as organized in 1809 included the land now constituting the States of Illinois and Wisconsin, and part of Upper Michigan; the Territory of Michigan after 1834 included all of the territory north of Missouri, Illinois, Indiana, and Ohio, and between Lakes Erie and Huron and the Missouri River; the Territory of Oregon as organized in 1848 covered all the territory of the United States north of latitude 42° N., and west of the Rocky Mountains; and the Territory of Nebraska as organized in 1854 contained land now in Montana, the Dakotas, Wyoming, and Colorado.

In connection with the slavery controversy the extent of the power of Congress over the Territories and the District of Columbia early became the subject of debate. Those who favored the restriction of slavery by constitutional means, including members of the Free-Soil and Republican parties (qq.v.), made the question of Congressional prohibition of slavery in the Territories a constant and in some cases a paramount political issue, while the pro-slavery partisans, recognizing that a Territory free from slavery would develop into a State free from slavery and thus disarrange the balance between the free and slave States in the national Senate, fought with great vigor and tenacity all proposed measures which had in view slavery prohibition in the national domain. As early as 1820 petitions were presented for abolition of slavery in the District of Columbia. By the Missouri Compromise (q.v.) of 1820 it was provided that Territories south of the line of latitude 36° 30′ N. might have slavery, while those north of that line should not. The question again came up in 1850, when, as one of the compromise measures, Utah and New Mexico were organized without reference to slavery (see COMPROMISE OF 1850), and in 1854 the so-called principle of popular or squatter sovereignty was established by the passage of the Kansas-Nebraska Bill (q.v.), which had for its basis the right of each Territory to determine for itself whether or not the institution of slavery should obtain within its limits. (See POPULAR SOVEREIGNTY.) In 1859, in the Dred Scott Case, the Supreme Court of the United States decided in an *obiter dictum* that the power of Congress over the Territories was limited by the obligation placed upon Congress to protect private rights in property, that slaves were property, and that, therefore, Congress could not constitutionally prevent slaves from being carried into any of the Territories. In 1863, however, slavery was abolished and slaves were emancipated in all national territory held or to be acquired.

The Territorial stage is one of preparation for the Commonwealth status. The Constitution empowers Congress to erect the Territories into States and admit them into the Union whenever it sees fit. Usually when the Territory has a population equal to that of the Congressional district the inhabitants memorialize Congress to pass an 'enabling act' empowering them to form a constitution, and prescribing the conditions to be fulfilled. In a number of instances, however, the inhabitants without asking for an enabling act have adopted a constitution and then applied for admission to the Union. As the language of the Constitution is not mandatory, but permissive, the question has arisen as to whether Congress in admitting new States may impose such conditions as it chooses, especially if such conditions were not imposed upon the original States. This was the main question in the controversy over the Missouri Compromise (q.v.), since which time Congress has admitted a number of new States under conditions which were not imposed upon the old States.

After the Spanish-American War the exact status of Territories as compared with the National Government and the rights and duties of the National Government with regard to Territories again came into controversy. In 1901, however, in the Insular Cases, the United States Supreme Court decided that Congress may freely determine when new Territories are to be incorporated into the Union, can create such forms of government as it sees fit for all regions outside the limits of the States, and can legislate differently for different parts of the national domain.

TERROR, Mount. See Erebus and Terror.

TERROR, Reign of. See French Revolution.

TER′RY, Alfred Howe (1827-90). An American soldier, born at Hartford, Conn. He studied at the Yale Law School, was admitted to the bar in 1849, and in 1854 was appointed Clerk of the Superior Court of Connecticut. He was a colonel in the State National Guard from 1854 until May, 1861, when he and his regiment entered the service of the Federal Government. He participated in the first battle of Bull Run, was mustered out the following month, and in September reëntered the service as colonel of the Seventh Connecticut Infantry. From that time until April, 1864, he was engaged in the military operations along the South Atlantic coast. He was promoted to the rank of brigadier-general of volunteers in 1862, and in 1864 he was given command of the Tenth corps of the Army of the James. In January, 1865, he commanded the second, and successful, Fort Fisher expedition. (See Fort Fisher.) Soon afterwards he occupied the city of Wilmington, N. C., which had been the last refuge of the blockade runners. For his services he was commissioned major-general of volunteers, and brigadier-general and brevet major-general in the Regular Army. From June, 1865, to August, 1866, he commanded the Department of Virginia. He was then placed in command of the Department of Dakota, and in 1876 he commanded the main column which drove Sitting Bull and his followers into Canada after the massacre on the Little Big Horn. Later he commanded the Department of the South and the Military Division of Missouri. He retired in 1888.

TERRY, Edward O'Connor (1844—). An English comedian and manager. He was born in London, and began his career upon the stage in 1863 in Hampshire. In 1867 he made his appearance in London at the Surrey Theatre. Then followed successful engagements at the Strand (1869) and Gaiety (1876) theatres, among his characters being *Paul Pry, Little Don Cæsar de Bazan*, and *Bluebeard*. In 1886 he presented at the Olympic Theatre his comedy of *The Churchwarden*. He opened Terry's Theatre in October, 1887, and there, a few months later, produced *Sweet Lavender*, himself playing Dick Phenyl. In 1892 he revived *The Magistrate*. In the season of 1897-98 he appeared in *The White Knight*.

TERRY, Ellen Alicia (1848—). A distinguished English actress, known in private life as Mrs. E. A. Wardell. She was born at Coventry. Her first appearance on the stage was as the boy Manilius in Charles Kean's revival of the *Winter's Tale*, at the Princess's Theatre, 1856. In March, 1863, Miss Terry made her appearance at the Haymarket in London, but with her marriage in 1864 she retired from the stage. She reappeared for a short time in 1867, and at length resumed her career in 1874. In 1875 she joined the Bancrofts at the Prince of Wales's Theatre, where she acted the part of Portia. Early in 1878 she had a great success in Wills's play of *Olivia* at the Court Theatre. At the end of the same year she began her long association with Henry Irving at the Lyceum, as Ophelia to his *Hamlet* (December 30, 1878). Of her rôles in the long list of his subsequent productions, only a few can be enumerated, her Portia in *The Merchant of Venice* (1879), which is perhaps her most complete success; Ruth Meadows in *Eugene Aram* (1879); Camma in Tennyson's tragedy of *The Cup* (1881); Juliet (1882); Viola in *Twelfth Night* (1884); Marguerite in *Faust* (1885); Fair Rosamund in Tennyson's *Becket* (1893); Madame Sans-Gêne in Sardou's play (1897); and Clarisse in *Robespierre* (1899). Her work has evoked a great variety of criticism, but its womanly charm is unfailing, and her leading place among English actresses is on the whole undisputed. Her first visit to America with Irving was in 1883, when she won a welcome, repeated many times since. Consult: Hiatt, *Ellen Terry and Her Impersonations: An Appreciation* (London, 1898); Scott, *Ellen Terry* (New York, 1900); id., *The Drama of Yesterday and To-Day* (London, 1899); Cook, *Nights at the Play* (1883); Winter, *Shadows of the Stage* (New York, 1892).

TERRY, Milton Spenser (1840—). A Methodist Episcopal minister, educator, and author. He was born at Coeymans, N. Y., educated at Troy University and Yale Divinity School. He entered the New York Conference 1863, serving churches around New York City, 1863-84. He became professor in the Garrett Biblical Institute, Evanston, Ill., in 1885. He has published *Biblical Hermeneutics* (1883); *Sibylline Oracles* (1890); *The New Apologetic* (1897); *Biblical Apocalyptics* (1898); *The New and Living Way* (1902); and several biblical commentaries.

TERSCHELLING, tĕr-skĕl′lĭng. One of the West Friesian Islands, in the North Sea, belonging to the Province of North Holland, Netherlands (Map: Netherlands, D 1). Area, about 20 square miles. Population, in 1899, 3929.

TERSTEEGEN, tĕr′stā-gen, Gerhard (1697-1769). A German mystic, noted as a hymn writer. He was born at Mörs and was a weaver of silk ribbons. After his conversion he practiced great self-denial in order to get means to help the poor. His religious ideas are like those of Angelus Silesius and Poiret, but the cast of his theology is Reformed. Besides his *Letters* (1773-75), he wrote *Lebensbeschreibungen heiliger Seelen* (1733-53) and *Geistliche Brosamen* (1769-74). A collected edition of his writings appeared at Stuttgart (1844-45). Consult: Jackson, *Gerhard Tersteegen* (London, 1832); Winkworth, *Christian Singers of Germany* (ib., 1869).

TERTIAN FEVER. See Malaria.

TERTIARY (Lat. *tertiarius*, one of the third rank, i.e. after the male and female members strictly belonging to an order, from *tertius*, third, from *tres*, three). A class in the Roman Catholic Church, who, without entering into the seclusion of a monastery, aspire to practice as far as possible in ordinary life the counsels of perfection laid down in the Gospel. Whatever earlier traces of this institution may be observable, there is no dispute that it was under the organizations founded by Saint Francis and Saint Dominic that it reached its full development. The rules for tertiaries, such as they have since substantially been maintained, were made public in 1221. The intending members must restore all ill-gotten goods, must renounce all evil practices, and abandon all feuds and enmities with their neighbors. Wives cannot be received without the consent of their husbands. The obligation of a tertiary, once accepted, is irrevocable, unless the party should be released, or should enter into a more strict religious life. The members are required to renounce luxury; they must frequent the sacraments; hear mass, if possible, daily; observe the fasts of the Church, as well as certain special austerities; cultivate charity toward all, with special obligations toward needy, sick, or afflicted brethren; and practice with more than common fervor the great Christian virtues. It is to be observed, however, that none of these obligations were supposed to bind the members under pain of mortal sin. Consult Adderly and Masson, *Third Orders* (London, 1902).

TERTIARY SYSTEM. A term applied in geology to the group of rocks included between the Cretaceous and Quaternary systems. It is one of the two periods constituting the Cenozoic era, the Quaternary being the other period. The term Tertiary was first suggested when it was considered that all strata were divisible into three groups, primary, secondary, and tertiary. The first two have been replaced in most localities by other names, but the third is still used, although not with its original significance. The Tertiary is one of the most interesting periods of geological history, presenting most complete sections and a great abundance of organic remains, and yet there has been much difficulty in classifying its different members correctly. The rocks are mostly unconsolidated and have rarely been laid down over great areas, so that in the United States, alone, there are no less than three or four separate regions of Tertiary rocks, in each of which a different series of subdivisions has to be adopted. The following classification of the American Tertiary is that compiled by W. H. Dall:

- Pliocene series
- Miocene series
- Oligocene series
  - Upper or Chipola stage
  - Lower or Vicksburg stage
- Eocene series
  - Jackson stage
  - Claiborne stage
  - Chickasaw stage
  - Midway stage

These main epochs and stages are recognized in all the Tertiary areas of the United States, of which there are four, viz. the Pacific Coast, Western interior, Atlantic Coast, and Gulf States. The section in the last-mentioned area is taken as the type.

At the end of the Cretaceous period a great topographic revolution took place in many parts of the world, and at that time the American continent had practically received its present form. The marine Tertiary deposits are found, therefore, chiefly along the borders of the continent, while the interior areas are of fresh-water formation, or perhaps in part æolian deposits. Many of the highest mountain ranges of the world, such as the Alps, Atlas, Caucasus, and Himalayas, were uplifted in the Tertiary period, their height being due to the fact that they are young geologically and consequently have not suffered greatly from erosive agencies.

The life of the Tertiary period presents many similarities to that of the present, although modern types had already begun to appear to some extent in the Cretaceous. In early Tertiary time the climate was very mild over the entire globe, and there was an abundant plant growth far to the north, plants being found in the rocks in many parts of Greenland. A gradual cooling of the climate followed, until at the end of the Tertiary there began the formation of the great continental glaciers that subsequently spread over so much of the temperate zone. The faunal changes that occurred during this period were in many respects remarkable. Of the smaller animals—the ammonites, belemnites, and other molluscan types that swarmed in the Cretaceous—few lived in the Tertiary. The great reptiles had also disappeared, but their place was taken by still more gigantic mammals. The fishes, amphibians, and birds closely resembled modern tpyes.

The Tertiary deposits inclose a variety of economic minerals. In the Cordilleran region many of the metalliferous veins are probably of Tertiary age, as are also some of the bituminous coals and lignites, in this same area, notably in Washington and Oregon. In the Tertiary beds of the Atlantic and Gulf States are many deposits of brick, pottery, and fire-clays, while much of the green sand obtained in the Atlantic coastal plain region is of Tertiary age. In Texas deposits of limonite are known in this formation, while in Florida and South Carolina there are great supplies of rock phosphate. Petroleum and mineral tar are obtained from the Tertiary deposits of southern California.

BIBLIOGRAPHY. Dall, *A Table of North American Tertiary Horizons*, Eighteenth Annual Report United States Geological Survey, part ii., page 323; Dana, *Manual of Geology;* Geikie, *Text-Book of Geology.* Other references will be found under the titles referred to below. See GEOLOGY; PALEONTOLOGY; EOCENE EPOCH; MIOCENE EPOCH; PLIOCENE EPOCH.

TERTULLIAN (Lat. *Tertullianus*), QUINTUS SEPTIMIUS FLORENS (born before 160, died after 220). One of the earliest Latin Church Fathers, a prolific writer, and the creator of ecclesiastical Latinity. He was born in Carthage, of heathen parentage, and trained for the profession of the law, which he practiced in Rome. Becoming a convert to Christianity shortly before the end of the second century, he returned to Carthage, where he was made presbyter and spent the rest of his life. About the year 203 Tertullian became a Montanist, and he was thenceforth unsparingly severe in his views of ecclesiastical discipline and in his judgments upon the alleged moral laxity of the 'psychics,' as he called the members of the Catholic Church. No other figure in the early Church stands out so distinctly as does this Carthaginian lawyer-priest. His intensity of character, alert intellect, blunt speech, keen satire, dialectical skill, moral strenuousness, and bitter partisanship, all combine to render him a marked personality. It was no doubt largely the result of his training that the expression of Tertullian's views was made in such a form as to imprint upon Western theology a legalistic character which it never lost, and which, through Augustine, passed over into Protestantism. He enjoys the further distinction of being the first to formulate in Latin the principles by which Catholic orthodoxy could infallibly be known. His *Prescription of Heretics*, for the clearness with which it enunciates these principles, has not improperly been described as 'a classic.' Were it not for his Montanist errors, Tertullian would rank among the greatest of the Latin Fathers. The time and circumstances of his death are unknown; there is no trace of him after about the year 220.

Among his many writings, the best known is the *Apology*, written probably in 197. It is a splendid vindication of the Christians against the attacks and false charges of the heathen world. His polemical zeal was further directed against Jews and heretics, e.g. in his *To the Nations*, *Against the Jews*, *Against Marcion*, *Against the Valentinians*, and *Against Praxeas*, the last named being especially valuable for the history of doctrine. He wrote many tracts on subjects connected with morals and church discipline, e.g. *On Baptism*, *Penance*, *Prayer*, *Patience*, *Idolatry*, and *Shows*. His characteristic strictness comes out even more strikingly in such works as those on *Women's Apparel*, *The Veiling of Virgins*, *Monogamy*, *The Exhortation to Chastity*, and *Fasting*. Consult: Rainy, *The Ancient Catholic Church* (New York, 1902); Simcox, *History of Latin Literature* (London, 1883); Cruttwell, *Literary History of Early Christianity* (ib., 1893); Teuffel-Schwabe, *History of Roman Literature*, translated by Warr (ib., 1900); Ebert, *Geschichte der Litteratur des Mittelalters* (Leipzig, 1889). The *Works* of Tertullian are published in the *Corpus Scriptorum Ecclesiasticorum Latinorum*, tom. xx., ed. by Reifferscheid and Wissowa (Vienna, 1890); an English translation will be found in *The Ante-Nicene Library*, American ed., vols. iii. and iv. (New York, 1885 et seq.).

TERUEL, tā'rōō-āl'. The capital of the Province of Teruel, in Aragon, Spain, on the left bank of the Guadalaviar, 72 miles northwest of Valencia (Map: Spain, E 2). It is a quaint old town with a handsome Gothic cathedral. Population, in 1900, 9538.

TÉRU-TERU. A lapwing-plover (*Vanellus Cayenensis*) of the eastern part of South America, whose specific characteristics are the long crest and long blunt yellow spur; also its sharp repetitive cry copied in its local name. Its habits on the pampas, where in the breeding season it executes remarkable 'dances,' are described at length by Hudson, who says the bird seems absolutely fearless of man at that period, dashing into his face until it becomes a nuisance. Consult Hudson, *Argentine Ornithology* (London, 1888).

TERZA RIMA, tĕr'tsȧ rē'mȧ (It., third rhyme, triple rhyme). A verse form of Italian origin, of which the first and most notable use was made by Dante in the *Divina Commedia*. Each stanza consists of three lines (usually hendecasyllables) with two rhymes; lines 1 and 3 repeat the middle rhyme of the preceding stanza, and thus the series of stanzas is closely interwoven. The series or *canto* is closed by a single line rhyming with the mid verse of the foregoing stanza. The whole scheme may be represented in this way: a b a, b c b, c d c . . . y z y z. Ordinarily the end of a stanza coincides with a pause in the thought, but so cohesible is the form that in the canto the strophic individuality may escape notice. There are several theories as to the development of the terza rima; it is doubtless based on an earlier form, but rather on the *serventese* (Provençal *sirventès*) than on the *ritornello*. Sir Thomas Wyatt, who was much under the influence of Italian models, introduced the stanza into English, choosing it for three satires. Sir Philip Sidney experimented with it in his *Arcadia*, and Milton tried it in a version of the second Psalm. There have been some attempts to preserve the original metre of the *Divina Commedia* in English translation, notably by Byron, who made a version of the Francesca episode in the *Inferno*. Byron's *Prophecy of Dante* is also written in terza rima. The best English specimen of this difficult stanza is Shelley's *Ode to the West Wind*. Consult: Cassini, *Sulle forme metriche italiane* (2d ed., Florence, 1890); Stengel, "Romanische Verslehre," in Groeber's *Grundriss der romanischen Philologie* (Strassburg, 1893, vol. ii., part i.); H. Schuchardt, *Ritornell und Terzine* (Halle, 1875); G. Paris, in *Romania*, vol. iv. (Paris, 1875); and Alden, *English Verse* (New York, 1903).

TESCHEN, tĕsh'en (Pol. *Cieszyn*). A town of Silesia, Austria, 63 miles west-southwest of Cracow, on the right bank of the Olsa (Map: Austria, F 2). It was formerly the capital of the Duchy of Teschen. It has manufactories of modules, carriages, clocks, screws, and furniture. There are also breweries, distilleries, flax-spinning mills, and book-binderies. Teschen is celebrated for the peace, May 13, 1799, which closed the War of the Bavarian Succession. Population, in 1900, 20,454.

TES'LA, NIKOLA (1857—). An inventor and electrician, born in Croatia, Austria. After a course in the schools of his native province, he studied engineering at Gratz to prepare himself as a professor of mathematics and physics, but becoming interested in electricity, he devoted himself to the study of engineering. He worked in the telegraphic engineering department of the Austrian Government until 1881, where he was engineer to an electric company. He then came to America and found employment for a while with the Edison Company at Orange, N. J. Subsequently he devoted himself to experimental research and invented much improved apparatus. He devised the principle of the rotary magnetic field, which made possible the transmission of power by means of the alternating current, particularly on long-distance lines, a system since extensively employed. He is the inventor of various electrical appliances, including dynamos, transformers, induction coils, oscillators, and arc and incandescent lamps, but is principally known for his researches in the matter of alternating currents of high frequencies and very high potentials.

TESSIN, tĕs-sēn′. The German name of the Swiss Canton of Ticino (q.v.).

TEST ACTS. Numerous acts of the English Parliament imposing religious tests upon persons in public office. The most famous are the Corporation Act of 1661 and the Test Act of 1673. The Corporation Act directed that all magistrates should take the oaths of allegiance and supremacy, as well as an oath renouncing the doctrine that it is lawful to take arms against the King, and provided that they must receive communion according to the rites of the Church of England. The Test Act, so called, imposed the like conditions on the holders of all public offices, civil and military, and obliged them in addition to abjure all belief in the doctrine of transubstantiation. Both of these acts were the result of the struggles against the Catholics in the reign of Charles II. They were repealed in 1828 as regards most of the provisions. See England.

TESTAMENT (OF., Fr. *testament*, from Lat. *testamentum*, will, publication of a will, from *testari*, to make a will, attest, testify, from *testis*, witness). Literally, a calling upon witnesses. Technically, in Roman law, a will; an act by which a person determines what person or persons shall take his property after his death. The oldest form of testation at Rome was a declaration in the presence and with the sanction of the Roman people in assembly or meeting as an army on the eve of battle. Of the scope and effect of this form of testation little is known. It could, apparently, be employed by patricians only, and it probably affected only such property as did not form part of the household estate (*pecunia* as distinguished from *familia*). In any case, the later Roman testament was developed on a different and independent basis. It started as a sale (*mancipatio*) of the inheritance, and became a secret and revocable instrument, signed and sealed by the testator and seven witnesses. As this mancipation testament is the ancestor of the testament or will in all modern countries, its development is described under Will. In English and American law the term testament is seldom employed except in the formal phrase 'last will and testament,' though its related terms—*testator*, one who disposes of property by will; *intestate*, one who dies without a will; *intestacy*, the state of leaving property undisposed of by will; and *testamentary* in various combinations, as 'testamentary act,' 'testamentary guardian,' 'letters testamentary,' etc.—are in common use. Consult Jarman on *Wills*.

TESTAMENT OF LOVE, The. A prose work erroneously credited to Chaucer by Speght in the 1598 edition. It was written about the close of the fourteenth century by a prisoner in peril of his life, and modeled on Boethius's *Consolation of Philosophy*, substituting for philosophy Divine Love.

TES′TAMEN′TUM PORCEL′LI (Lat., Last Will of a Little Pig). An amusing Latin skit parodying the legal testamentary forms. It is of unknown authorship, and was written before the fourth century A.D. According to Saint Jerome, it was a favorite piece for recitation by schoolboys. The little pig disposes of his various parts to his friends and relatives, all of whom bear names suggestive of some form of pork. The text is printed in Bücheler's smaller edition of Petronius (Berlin, 1886), and is edited with English notes in Peck and Arrowsmith's *Roman Life in Latin Prose and Verse* (New York, 1894).

TESTIMONY (from Lat. *testimonium*, testimony, from *testis*, a witness). The declarations or statements as to the facts in issue made by witnesses in a judicial proceeding. This may include such written statements as are admissible under the rules of evidence. Although the terms evidence and testimony are often used interchangeably, the former is strictly a more general term, including every legal means of proving facts, as, for example, the introduction of an object for inspection by the jury, whereas testimony is properly only that portion of the proof which is directly adduced from witnesses. A party may impeach or show to be false the testimony of his adversary's witnesses, but cannot impeach the credibility of one of his own witnesses. The testimony in a case includes both the direct and cross-examination of witnesses. See Evidence, and the authorities there referred to.

TESTING MACHINE. A machine employed for testing and determining the strength of materials used in construction and engineering works. In order to determine the strength of a given material such as the iron or steel used in a boiler or engine, the wood of a building, or brick, stone, cement, etc., it is usual to select small samples and submit them to stresses of varying degrees, from which the characteristics of the material may be learned and various numerical values obtained. Testing machines may depend upon the action of an hydraulic press or of a system of screws and gears by means of which a given force applied can be greatly multiplied by the time it is directly exerted on the piece under test. The various tests will be found discussed under Strength of Materials, to which the reader is referred.

TESTRY, tĕs′trē′. A village of France, near Péronne, in the Department of Somme, noted as the scene of a battle (687) in which Pepin of Heristal, the Austrasian Mayor of the Palace, defeated the forces of Neustria and Burgundy, thus bringing the three Frankish kingdoms under his power. See Franks.

TESTU′DINA′TA. The reptilian order Chelonia (q.v.).

TESTU′DO (Lat., tortoise). A device of Roman warfare, by means of which a body of men advanced for assault. The attackers would move in close order, with their shields held above their heads, the edges overlapping. The effect closely resembled the shell of a tortoise (*testudo*), and proved a very effective protection from the darts and weapons of the defenders. A later improvement was the *testudo* machine, which moved on wheels and was roofed over, and under the protection of which soldiers could destroy or undermine the walls of the defenses. A modified form of the same principle is seen in the flying sap.

TET′ANUS (Lat., from Gk. *τετανός*, spasm, tension, from *τείνειν*, *teinein*, to stretch, strain), or Lockjaw. An infectious disease characterized by tonic spasms of the voluntary muscles, with marked exacerbations. The contractions may be confined to the muscles of the lower jaw (trismus), to certain other groups of muscles, or involve all the muscles of the body. The disease is dependent on a bacillus, discovered by Nicolaier in 1884, and cultivated by Kitasato in 1889. The bacillus forms a slender rod with rounded ends, and exists in dust and surface soil. This accounts for the fact that wounds infected by dust are often followed by tetanus. The organism gains entrance to the tissues often through wounds so slight as to be overlooked. The disease may follow surgical operations or childbirth, infecting the mother through the parturient canal and the child *via* the cut umbilical cord. Vaccination wounds are sometimes the port of entry for the bacillus. In a very few instances the disease is claimed to be *idiopathic* and to follow exposure to cold or damp.

After an injury the disease sets in usually within ten days. Without any warning the patient feels a stiffness at the back of the neck, and then in the jaws, so that he is unable to open his mouth widely or to masticate properly. These symptoms continue for a day or two, or the patient may rapidly come to the stage of general rigidity, in which the muscles of the trunk and extremities are affected. The back becomes rigid and arched (opisthotonus); the muscles of the abdomen become hard and boardlike; respiratory movements are limited by the rigid muscles. By this time the jaw is firmly closed by contraction of the masseter muscles, and the other muscles of the face drawn into the painful smile known as the *risus sardonicus.* When this stage has been reached violent convulsions of the hitherto rigid muscles supervene. During a paroxysm the patient's teeth are tightly clenched, while the breathing process is held in temporary suspension, with imminent danger of death. The spasms are intensely painful, and occur at first at intervals of half an hour or more with gradually increasing frequency as the disease progresses. Muscular contractions are sometimes so forcible as to rupture a muscle or break a bone. In a majority of cases the disease progresses to a fatal end in a few days; the paroxysms become more violent and frequent and death comes from exhaustion, fixation of the respiratory muscles, or spasm of the glottis. There may be little fever during the attack, but before death an extraordinary rise in temperature may take place.

The treatment of tetanus is unsatisfactory. About 90 per cent. of the traumatic cases die, and about 50 per cent. of other cases, the result depending to a great extent on the size of the wound and severity of the infection. The bacilli multiply and produce their toxins in the neighborhood of the injury, and when this can be found it is to be opened freely and treated with antiseptics to prevent further infection. The drugs having the best results in tetanus are chloral, potassium bromide, and calabar bean, with the occasional use of chloroform to control violent spasms and opium to produce sleep. In many cases cure follows the injection of an antitetanic serum, derived from the blood of a horse that has been rendered immune by repeated injections of a culture of the bacillus. (See SERUM THERAPY.) A great many cases of infantile tetanus can be prevented by antiseptic treatment of the stump of the umbilical cord. Tetanus in infants (*trismus nascentium*) is very fatal, being uninfluenced even by antitoxin. Consult: Moschcowitz, *Tetanus* (Philadelphia, 1900); Bassano, *Recherches expérimentales sur l'origine microbienne du tétanos* (Paris, 1900).

TETANUS, IN ANIMALS. A disease attributed to the action of Bacillus tetani, which attacks domestic animals, most frequently horses and sheep. It is usually produced by cold and wet, by intestinal worms, obstinate constipation, or injuries. Considerable doubt exists, however, as to the nature of spontaneous tetanus. The symptoms usually come on gradually, involving most of the muscular structures, which become hard and rigid. The nose is protruded, the limbs move stiffly, the tail is upraised, the bowels are constipated. The patient must be kept perfectly quiet, and in an airy but comfortably warm place, and plentifully supplied with cold water, and soft, sloppy, but nutritious food, which he will usually greedily suck in through his firmly closed teeth. Any discoverable wound should be fomented or poulticed; bleeding, sedatives, and all causes of irritation must be avoided. The only promising treatment thus far discovered consists in injections of antitetanus serum as soon as the disease is diagnosed. Many cases of tetanus may be prevented by applying antiseptic washes to wounds in which the tetanus bacillus may become lodged. In adult animals most cases are fatal; but among young animals, especially when the attack results from exposure to cold, many recoveries occur.

TÊTE DE PONT, tât d*e* pôɴ (Fr., bridgehead). An important field-work fortification, generally open at the gorge. The flanks rest on the banks of a river, thus securing command of or covering one or more bridges. See FORTIFICATION.

TE'THYS (Lat., from Gk. Τηθύς). In Greek mythology, daughter of Uranus and Gæa, and, by Oceanus, mother of the Oceanids and river gods.

TETRACHORD (from Gk. *τετράχορδος*, *tetrachordos*, having four strings, from *τέτρα-*, *tetra-*, four + *χορδή*, *chordē*, string, cord). In music, a system of four tones comprised within the compass of perfect fourth. The Greek scales were composed by joining two tetrachords. In the Middle Ages the tetrachord was superseded by the hexachord, introduced by Guido d'Arezzo. See GREEK MUSIC.

TETRADYMITE (from Gk. *τετράδυμος*, *tetradymos*, four-fold, from *τέτρα-*, *tetra-*, four; so called from its frequent occurrence in twin crystals). A mineral bismuth telluride frequently containing sulphur and selenium. It is crystallized in the hexagonal system, has a metallic lustre, and is of a steel-gray color. It is found in Norway, Sweden, and in the United States at various localities in Virginia and North Carolina.

TET'RAGRAM'MATON (Gk. *τετραγράμματον*, word of four letters, neu. sg. of *τετραγράμματος*, *tetragrammatos*, having four letters, from *τέτρα-*, *tetra-*, four + *γράμμα*, *gramma*, letter, from *γράφειν*, *graphein*, to write). A term used to designate the name of Israel's God, consisting of the four letters Y H W H. In the Massoretic text it occurs 6823 times and is written with the vowels of Adonai, 'Lord' (originally 'my Lord'), or with those of Elohim, 'God.' By these vowels the reader was warned not to pronounce the divine name, but to substitute for it Adonai or Elohim. (On the reasons for this custom, see JEHOVAH.) It is found as early as in the second century B.C. in the Greek version (see BIBLE), which uses Κύριος, *Kyrios*, 'Lord,' for the tetragrammaton. The editorial revision of Book II. in the Psalter (Psalms xlii.-lxxii.) also substitutes for it Elohim. There is little room for doubt that the original pronunciation was Yahwe, the final *h* being inaudible. According to Theodoret the Samaritans (q.v.) pronounced the name Ἰαβέ, *Yabe* or *Yave*, and this statement is borne out by extant Samaritan hymns where the rhyme indicates that pronunciation. The same pronunciation is ascribed to a Christian sect by Epiphanius and is found in Egyptian papyri. An Ethiopic manuscript gives the form Yawe, in which the vowels are indicated. The name *Iao* frequently found in manuscripts and papyri goes back to Yahu. That Yahu or Yah existed in Syria as a divine name before the Hebrew invasion is probable and receives some support from Egyptian inscriptions. The fact that it occurs chiefly in late Old Testament writings may be due to an archaistic tendency not seldom seen in connection with the liturgy. Yah at the end of a name and Yeho at the beginning meet us so often in pre-exilic times that it is likely to be very old. It is also significant that Yahwe never seems to be used in theophorous names. Since it was at all times permitted to pronounce Yahu, it is not strange that the Greeks and Romans should have got the impression that the name of the god of the Jews was *Iao*. The earliest datable occurrence of the tetragrammaton is in the inscription of King Mesha of Moab, c.840 B.C. Through the Samaritans and certain Jewish sects the knowledge of the proper pronunciation was perpetuated. While the Samaritans of the seventeenth century refused to divulge this secret, Sabbatai Zewi (see MESSIAH), the famous mystic and claimant to the Messiahship, insisted upon the pronunciation of the tetragrammaton. The hybrid form Jehovah, made up of the consonants of Yahwe and the vowels of Adonai, was first used in 1520.

Consult: Baudissin, *Studien zur semitischen Religionsgeschichte* (Leipzig, 1876); Driver, in *Studia Biblica* (Oxford, 1885); Dalman, *Der Gottesname Adonaj und seine Geschichte* (Leipzig, 1889); W. Max Müller, *Asien und Europa* (Leipzig, 1893); Dietrich, in *Zeitschrift für alttestamentliche Wissenschaft* (Giessen, 1883); Deissmann, *Bibelstudien* (Marburg, 1895).

TETRAHEDRON (from Gk. τέτρα,- *tetra-*, four + ἕδρα, *hedra*, base). A solid bounded by four planes. It appears in nature, and as a crystal is classified as a secondary form of the octahedron, produced by removing the alternate angles or edges of the latter. See POLYHEDRON.

TETRALOGY (from Gk. τετραλογία, *tetralogia*, group of four dramas, from τέτρα-, *tetra-*, four + λόγος, *logos*, word). (1) In Greek drama, a series of three tragedies and a satyric drama presented in sequence. The satyric drama was in some cases connected with the tragedies in subject, but its main purpose was to relieve the tension caused by the trilogy. (2) A musical drama in four parts. Wagner's famous tetralogy, *Der Ring des Nibelungen*, consists of *Das Rheingold*, *Die Walküre*, *Siegfried*, and *Götterdämmerung*. See TRILOGY.

TETRAMETER. See VERSIFICATION.

TETRAPOLITAN CONFESSION. See SACRAMENTARIAN.

TE'TRARCH (Lat. *tetrarches*, from Gk. τετράρχης, governor of a fourth of a country, from τέτρα-, *tetra-*, four + ἀρχειν, *archein*, to rule). Originally, the governor of one of four divisions of a kingdom or country; but, in the usage of the later Roman Empire, any minor ruler, especially in the East, possessing sovereign rights within his territory, but dependent on, and in many cases removable at the pleasure of, the Emperor. This was especially the case in Syria, where the princes of the family of Herod are called indiscriminately by this title (Luke iii. 1) and by that of king (Matt. xiv. 9). The tetrarch in this latter sense was in truth a sovereign, although a dependent sovereign; and there are instances in which the title seems to have been applied to really independent sovereigns of small principalities.

TETSCHEN, tĕch'*e*n. A town of Bohemia, situated on the right bank of the Elbe, near the Saxon frontier. An active industrial place, having a number of factories and carrying on a lively trade, it is the emporium for the shipping traffic on the Elbe, and with its picturesque surroundings is also the culminating point of that part of the Elbe Valley included in Saxon-Bohemian Switzerland. The handsome château of Count Thun, built in 1667-73, with a fine park, garden, and hothouses, library, and collection of coins and weapons, was once fortified and a place of some importance in the Seven Years' War. Population, in 1890, 7299; in 1900, 9698, Germans.

TETTENBORN, tĕt'*e*n-bôrn, FRIEDRICH KARL, Baron (1778-1845). A German soldier, born in the Principality of Sponheim. He entered the Austrian Army in 1794, serving in the wars of the French Revolution. At the battle of Wagram, in 1809, he won distinction by his bravery. Just before the invasion of Russia by Napoleon in 1812 he entered the Russian Army as a lieutenant-colonel, commanded Kutusoff's vanguard, and greatly harassed the French on their retreat. In 1813 he entered Berlin, together with the Russians, and thence proceeded to Hamburg, which he occupied, but whence he was driven May 30th. He next fought against Davout and Pecheux and captured Bremen October 15th. He served with Bernadotte in Jutland and on the Rhine in 1814. In France, during the invasion of the Allies, he did excellent service in keeping open communications. In 1818 he entered the service of Baden, and in 1819 was promoted to be lieutenant-general, and was sent as Ambassador to Vienna, where he died.

TETUAN, tĕt-wän'. A town of Morocco about 30 miles southeast of Tangier, on the Martil. It lies in the midst of fine gardens and is surrounded by dilapidated walls. In the background loom the Rif Mountains. The rows of white houses rise in terraces. The streets are narrow and dirty, but there are many fine residences built by the Moors expelled from Spain. Gunbarrels, coarse woolen cloth, and sashes are manufactured. Grain, fruits, wool, silk, leather, and beef cattle are exported, mainly to Gibraltar.

The port, fortified by two forts, is one mile below the town at the mouth of the Martil, and is the only open Mediterranean port in the country. Population, about 25,000, of which 6000 are Jews. Tetuan was the centre of operations in the Spanish-Moroccan War of 1859-60. General O'Donnell received the title of Duke of Tetuan.

TET'ZEL, Johann (c.1460-1519). A German Dominican, famous for his connection with the Reformation through Luther's attacks on his sale of indulgences. He was born at Pirna, in Saxony, about 1460, and educated at the University of Leipzig, where he graduated in 1487, soon afterwards entering the Dominican Order. Being a popular and effective preacher, he was intrusted with the proclamation of an indulgence, first on behalf of the Teutonic Knights from 1504 to 1510, and from 1516, as a subordinate of Albert of Brandenburg, Archbishop of Mainz, on the occasion of the indulgence published in favor of contributors to the building fund of Saint Peter's at Rome. It was in opposition to the preaching of Tetzel that Martin Luther published his celebrated theses, on October 31, 1517. Tetzel published a series of counter-theses in the following January, and in May a reply to Luther's celebrated sermon on indulgences. In January, 1519, he was called upon to appear before the Papal legate Von Miltiz to answer charges made against him, and was severely rebuked for unguarded language and improprieties in procedure. For his life consult Hermann (Frankfort, 1883); Paulus (Mainz, 1898); Körner (Frankenberg, 1880); Kayser, *Geschichtsquellen über Tetzel* (Annaberg, 1877);, and Röhm, *Zur Tetzel-Legende* (Hildesheim, 1890).

TEUBNER, toip'nĕr, Benedictus Gotthelf (1784-1856). A German bookseller, printer, and publisher. He was born at Gross-Kraussnigk, and became a bookseller at Leipzig in 1811. His house soon grew to be one of the most important in Germany. In 1832 he founded a printing house in Dresden. The firm is best known for cheap, accurate, and scholarly editions of Greek and Latin classics.

TEU'CER (Lat., from Gk. Τεῦκρος, *Teukros*). The name of two kings in Greek legend. The first seems merely an invented eponymous hero for the *Teucri*, traditionally the early inhabitants of the Trojan plain. He is not mentioned in the early epic, but later is called the son of the river-god Scamander and a nymph of Mount Ida. Another version brought him from Crete. It was said that he gave his daughter, Bateia, in marriage to Dardanus (q.v.), who succeeded him as king. The other Teucer appears in the *Iliad*, and remained a popular figure of legend. He was the son of Telamon, King of Salamis, and Hesione, daughter of Laomedon, King of Troy. He accompanied his half-brother Ajax (q.v.) to Troy, where he was the best archer among the Greeks, but on his return his father would not allow him to land at Salamis because he had not avenged the death of his brother Ajax nor brought back Tecmessa and her son by Ajax, Eurysaces. Teucer sailed for Cyprus, where he founded another Salamis.

TEUFELSDRÖCKH, toi'fels-drĕk, Herr. In Carlyle's *Sartor Resartus*, the eccentric German professor whose speculations on the 'philosophy of clothes' forms the vehicle for the satire of the work.

TEUFFEL, toi'fel, Wilhelm Sigmund (1820-78). A German classical scholar, born at Ludwigsburg, Württemberg. He studied at Tübingen, where he became professor of classical philology in 1849. He died at Tübingen, March 8, 1878. His principal work is the *Geschichte der römischen Litteratur* (Leipzig, 1870, 5th ed. 1890). It has been translated into English. Teuffel also published *Studien und Charakteristiken zur griechischen und römischen, sowie zur deutschen Litteraturgeschichte* (Leipzig, 1871, 3d ed. 1889), and *Lateinische Stilübungen*, besides editions of the *Persæ* of Æschylus and the *Clouds* of Aristophanes.

TEUTONES. See Teutonic Race.

TEUTONIC AND SCANDINAVIAN MYTHOLOGY. See Scandinavian and Teutonic Mythology.

TEUTONIC KNIGHTS (The Teutonic Knights of Saint Mary's Hospital at Jerusalem). An order of knighthood which originated in a brotherhood formed by German knights in 1190 during the siege of Acre by the Crusaders and recognized by Pope Clement III. in 1191. In 1198 this association was changed into an order of knighthood as a balance to the political influence of the Templars and Hospitalers. Hermann von Salza, grand master from 1210 to 1239, saw no future in Palestine, and the order engaged in the conquest of the heathen Prussians, inhabiting the Baltic regions to the northeast of Germany. After a fierce struggle of half a century they completed their subjugation in 1283. Christianity was planted with fire and sword, cities were founded, and the land was colonized by Germans. In 1237 the Teutonic Knights absorbed the order of the Brothers of the Sword, and so acquired Livonia and Kurland. They waged long wars with the Lithuanians for the possession of the territory intervening between these regions and the Prussian country. Early in the fourteenth century they extended their dominion westward, making themselves masters of Danzig and Little Pomerania (Pomerellen). They became a great power and their State prospered, but the Knights themselves remained a ruling aristocracy, and were hated by the conquered natives and Germans alike. In 1410 the power of the Teutonic Knights sustained a great blow through their defeat in the battle of Tannenberg at the hands of the Poles and Lithuanians. In 1466 they were compelled in the Treaty of Thorn to cede West Prussia to Poland and to agree to hold East Prussia as a Polish fief. Half a century later the Knights of the Sword cut loose from the Teutonic Knights, whose dominion was now restricted to East Prussia. In 1525 the grand master, Albert of Brandenburg (q.v.), having embraced Protestantism, laid down his office and converted the State over which he ruled into the hereditary Duchy of Prussia, for which he did homage to the King of Poland. The order was composed of knights, priests, and servants. The rule followed was that of Saint Augustine. The insignia was the white mantle with the black cross. After the secularization of the Prussian domain of the Teutonic Knights the order continued to exist in Germany, having numerous possessions, mostly of very small extent, scattered throughout the Empire. Its head resided at Mergentheim (now a town of Württemberg). The order was abolished by Napoleon in 1809, and its possessions were confiscated. It was revived as an Imperial Austrian order in 1834. Its head is an Austrian archduke. Consult: Strehlke, *Tabulæ Ordinis Theutonici* (Berlin, 1869); Voigt, *Geschichte des deutschen Ritterordens* (1857-60).

TEUTONIC LANGUAGES (Lat. *Teutonicus*, from *Teutoni*, *Teutones*, a people of ancient Germany, connected with Goth. *þiuda*, AS. *þēod*, OHG. *diot*, Ir. *tūath*, Lith. *tautà*, Oscan, *touto*, country, people), or GERMANIC LANGUAGES. The group of languages of the Indo-Germanic family (see INDO-GERMANIC LANGUAGES) spoken by the Teutonic or Germanic stock. (See TEUTONIC RACE.) It is divided into three main groups: East Teutonic, North Teutonic, and West Teutonic, or perhaps, more familiarly, East Germanic, North Germanic, and West Germanic. It has been the custom, for very slight grammatical reasons, to group East and North Germanic together as East Germanic, but the threefold division is now definitely established.

EAST GERMANIC. This division seems to be entitled to the collective name Vandal. The more prominent East German peoples were the Goths (q.v.), the Vandals (q.v.) (in the narrower sense), and the Burgundians. (See BURGUNDY.) Of the last-named only scanty linguistic remnants have survived, which are discussed by R. Kögel, in Haupt's *Zeitschrift für deutsches Altertum*, vol. xxxvii. (Berlin). Of the language of the Vandals likewise little remains. The remnants of their dialect are treated by Wrede, *Ueber die Sprache der Vandalen* (Strassburg, 1886). The most important of the East Germanic peoples were the Goths. (See GOTHIC LANGUAGE.) The Gothic language perished with their empires, except that a last remnant of Goths found an oasis in the Crimean peninsula. Busbecq, a Flemish traveler, in the middle of the sixteenth century, still heard the Gothic language spoken there, and selected eighty-six words as specimens of the language (Krim or Crimean Gothic). Our knowledge of Gothic depends almost entirely upon the language of the Visigoths in the Roman province of Mœsia, as written down by Ulfilas (q.v.). Here the Teutonic dialects emerge for the first time from semi-barbarism into literary form.

NORTH GERMANIC. The four dialects of this group, Swedish, Danish, Norwegian, and Icelandic, show but slight traces of dialectic difference before the eleventh century, as is proved by the evidence of the Norse runes (q.v.). The Scandinavian languages after the eleventh century, however, are divided into East and West Scandinavian, or East and West Norse. The eastern division consists of Swedish (including the dialect of the island of Gotland) and Danish; the western division of Norwegian and Icelandic.

WEST GERMANIC. Linguistically West Germanic is best divided into Anglo-Saxon or English, Frisian, Low German (Old Saxon), Franconian, and High German.

Anglo-Saxon or English.—The history of the English language may be divided into four periods: (1) Anglo-Saxon with its four slightly differentiated dialects, Northumbrian and Mercian, forming the Anglian branch, and West Saxon and Kentish (Jutes), forming the Southern branch. Anglo-Saxon records begin with the eighth century; the language lasted till the middle of the thirteenth century, when it assumed the character of (2) Old English (1250-1350), followed by (3) Middle English (1350-1550), to which succeeded (4) Modern English. See ANGLO-SAXON LANGUAGE AND LITERATURE; ENGLISH LANGUAGE.

Frisian.—Frisian is still spoken in Holland, but in general Low German has taken its place. A branch of this language, called North Frisian, is still spoken in the southern part of the west coast of Schleswig and in the adjacent islands, Sylt, Föhr, and Amrum, as well as Helgoland. Old Frisian and the Anglian dialect of Anglo-Saxon are closely related in grammar and vocabulary. See FRISIAN LANGUAGE.

Low German (Old Saxon).—Low German speech differs markedly from Anglo-Saxon. The name Saxon has spread so far from its original home that we may safely suppose that the Saxons in the course of their conquests in North Germany spread their name politically, but at the same time blended their speech with that of the conquered tribes. In its modern continuation Old Saxon is Plattdeutsch. See GERMAN LANGUAGE; PLATTDEUTSCH.

Franconian.—The Franconian dialects of the present day in Middle Germany (Middle Franconian, Rhenish Franconian, and East Franconian) differ but little from High German. (See GERMAN LANGUAGE.) The Lower Franconians (Franks) settled in the Netherlands during the early centuries of the Christian Era. The Franconian dialect spoken there down to the sixteenth century is called Old Low Franconian. It is continued to the present day in the Dutch of Holland, and in the Flemish of Flanders in Belgium. See DUTCH LANGUAGE; FLEMISH LANGUAGE.

High German.—For the character of High German speech, for its extent and distribution in modern times, and for the development of literary Modern High German, see GERMAN LANGUAGE.

GENERAL CHARACTERISTICS. The Teutonic languages have, perhaps, more than any other Indo-Germanic languages, developed striking special characteristics which differentiate them from the remaining languages of the family. These concern vocalism, consonantism, declension, and conjugation. As regards vocalization the Teutonic treatment of ablaut (q.v.) is peculiar. In the common Indo-Germanic period ablaut was a purely phonetic phenomenon, but in the Teutonic languages, owing to the prevailing loss of the reduplication (q.v.) in the perfect of the verb, and the reduction or loss of endings, ablaut has been adapted to a quasi-grammatical property. Thus the changes of the root vowel in Greek *δέρκομαι*, *δέδορκα*, *ἔδρακον*, are identical with those in German *werde*, *ward*, *geworden*, but in the Greek the vocalic changes are not associated consciously with the changes of tense. On the other hand, in the German *ward* the vowel *a* carries the preterite sense of the verb. Even more clearly the vowels have become grammatical in English *sing*, *sang*, *sung*, and many similar sets. The prominence of the ablaut has also contributed to analogical spread, and a considerable degree of generalization which has resulted in the six so-called ablaut-series which comprise the majority of the so-called strong verbs. Some of the types of these series in Gothic are: *beita, bait, bitum,* 'to bite;' *kiusa, kaus, kusum,* 'to choose;' *binda, band, bundum,* 'to bind.' The phenomenon known as umlaut (q.v.), that is, the assimilation of a given vowel to the vowel of a neighboring syllable, although it rests upon a universal phonetic tendency, is also specially prominent in all periods of the history of Teutonic speech. Thus, in Old High German *a* changes to *e* before *i* in a following syllable; singular *lamb,* 'lamb,' but plural *lembir* (New High German *Lamm* and *Lämmer*); or *u* changes to *ü* (*ui*) before *i* in a following syllable; singular *chrût,* 'weed,' but plural *chriuter, chriutir* (New High German *Kraut* and *Kräuter*). Umlaut has also been adapted to grammatical distinction, as in German *Mann, Männer,* and English *man, men;* in the latter case, owing to the loss of endings the umlaut of *men* has become the sole sign of the plural.

Very characteristic is the treatment of the Indo-Germanic lingual and nasal vowels in all Teutonic languages, as *u* + lingual or nasal, giving the groups *ur, ul, um,* and *un;* e.g. Indo-Germanic **ṷḷqos,* Skt. *vṛka,* 'wolf,' appears in Gothic as *wulf,* and Indo-Germanic **kṁtom,* Skt. *śatam,* 'hundred,' appears in Gothic as *hund.*

The most characteristic of all Teutonic phenomena is the series of changes which has taken place in the original Indo-Germanic stop consonants, the so-called shift or 'rotation' of consonants, known as Grimm's law (q.v.). A group of exceptions concerning the continuance in Teutonic of the Indo-Germanic tenues, both aspirate and non-aspirate, as either surd or sonant fricatives, according to the position of the word-accent, was explained by Karl Verner. See VERNER'S LAW.

In the domain of noun-declension the most important Teutonic phenomenon is the spread of the *n*-stems, giving rise to the important distinction between the weak declension (*n*-declension) and the strong declension (declensions without *n*). Especially, every adjective may be inflected according to the weak or *n*-declension, being then used as the so-called definite form of the adjective in connection with the definite article, in distinction from the indefinite adjective with the indefinite article. The starting point for this is prehistoric. Already in Indo-Germanic times adjectives were substantivized by transition to the *n*-declension. A parallel to the double adjective is found in the Balto-Slavic languages, which have produced a 'definite' adjective by compounding the 'indefinite' with the pronominal stem *i̯o-*.

The most important feature of the Teutonic languages in the field of conjugation is the distinction between strong and weak verbs, based in the main upon the different treatment of the perfect. The strong verbs were originally primary; they employed the non-thematic, and very largely reduplicated, perfect of Indo-Germanic times; as Gothic present *wairþa,* 'I become,' perfect *warþ.* The weak verbs were mostly secondary or denominative present stems, which supplied their perfect by a periphrastic form made by fusion of the verb-stem with a preterite form of the root *dhē,* 'to set,' as Gothic present *nasja,* 'I save,' perfect *nasida.* Especially in the later periods of Teutonic speech the historical limits of the two classes are effaced. The old type of préterite-presents, which are presents in function, also associate with themselves the weak perfect, so that German *weiss,* 'know' (Gothic *wait,* Greek *οἶδα*) forms the weak perfect *wusste,* 'knew.' Consult: Grimm, *Deutsche Grammatik* (new ed., Berlin and Gütersloh, 1870-97); Streitberg, *Urgermanische Grammatik* (Heidelberg, 1896); Dieter, *Laut- und Formenlehre der altgermanischen Dialekte* (Leipzig, 1898 et seq.); Paul, *Grundriss der germanischen Philologie* (2d ed., Strassburg, 1901 et seq.). See also the articles on the various languages of the Teutonic group and the bibliographies there given.

TEUTONIC RACE. The name applied to a division of the European peoples, comprising nearly the whole or the bulk of the population of the German Empire, the Scandinavian countries, the Netherlands, Great Britain, Switzerland, the United States, Canada, Newfoundland, Australia, New Zealand, and Cape Colony, about two-thirds of the inhabitants of Cisleithan Austria, and half the population of Belgium (Flemings). It is also represented by large numbers in Hungary and in the Baltic Provinces, Finland, and other parts of Russia, and is found scattered over the whole world. They have long heads and faces, very light hair, blue eyes, tall stature, and narrow, aquiline noses. The oldest traceable home of the Teutons seems to have been in the region between the middle and lower courses of the rivers Elbe and Oder. Adjacent tracts, reaching to the river Vistula in the east, to the Harz Mountains and the Thuringian forest in the south, from the Elbe to the Rhine in the West, and across Denmark to the Scandinavian peninsula in the north, were all occupied by Teutons about the second century B.C. Pliny and Tacitus mention the Basternæ, or Bastarnæ (q.v.), who appear on the Black Sea about B.C. 200. Next of the Germanic races to force their way southward were the Cimbri (q.v.), who came down about 2000 years ago from their northern home in the Cimbrian (Danish) peninsula, were joined by the Helvetian Teutones, and penetrated as far as Upper Italy, only to be destroyed by Marius in B.C. 102-101. Cæsar, bent upon conquering Gaul, clashed with another German tribe, the Suevi (Swabians). The defeat of Ariovistus in B.C. 58, and the subsequent invasions of Germany by the Roman legions, prevented the Germanization of Gaul, and confined the Germans within the Rhine. Several centuries after Christ came the later migrations. Of these the principal ones were those of the Burgundians, Vandals, and Goths, from Eastern Germany southward toward the Danube, and thence westward into Italy, Gaul, Spain, and Africa, and the conquest of the Celtic Britain by the Saxons, Jutes (Danes), and Angles. Later followed the piratical Viking raids of the Norse Danes and Norwegians into the northern islands of Europe, into France (Normandy), and the Mediterranean coast. Simultaneously with these movements occurred the colonization of Iceland, followed by the settlement of Greenland. Afterwards came the Norman conquest of England and of Southern Italy and Sicily.

The original home of the Burgundians (q.v.) was on the west side of the upper course of the river Vistula. In the third century A.D. they migrated to the region of the Lower Danube. At the end of the same century they migrated westward; at the beginning of the fifth they founded their kingdom in the Rhenish Palatinate. This kingdom was destroyed in 437 by the Huns; the Burgundians settled in Savoy, and thence they founded a new State on the banks of the river Rhone, which fell into the hands of the Franks in 534. After that they were Romanized. See Burgundy.

The earliest traceable home of the Vandals seems to have been on the shores of the Baltic. From there they seem to have migrated to the region of the Riesengebirge ('Vandal Mountains') to the north of Bohemia. But in the third century they are found in the far south in Dacia by the side of the Goths. At the beginning of the fifth century they moved with other German tribes into Gaul, thence into Spain, finally crossing over into North Africa to found there in 429 their famous empire. This was destroyed by the Byzantine Emperor Justinian in 534. See Vandals.

The earliest home of the Goths in historic times seems to have been to the east of the Burgundians on the east side of the upper course of the river Vistula. In the third century A.D. they had settled in the Roman province of Dacia north of the Lower Danube and in the adjoining region north of the Black Sea. At that time they were already divided into Visigoths, or West Goths, and Ostrogoths, or East Goths. The Gepidæ, a closely related tribe, had followed them south and were located to the north of the Visigoths. Momentum was imparted to this great Teutonic mass by the incursions of the Huns, who began at that time to pour into Europe through the great gate between the Ural Mountains and the Caspian. The East Goths submitted to the Huns. The Visigoths, after seeking refuge in the Roman dominions south of the Danube, began that important westward movement which first landed them in Italy, whence they were expelled; next in Gaul, of which they conquered the region between the rivers Rhone and Loire, and the Pyrenees; and finally in Spain, where they sustained themselves until they succumbed to the Saracens in 711. The Ostrogoths, submitting to the Huns, became part of Attila's empire, but after his death achieved independence and founded their State in Pannonia (Hungary). In 488 they broke into Italy, finally vanquished King Odoacer in 493, and founded their own short-lived kingdom, which succumbed to Justinian's generals, Belisarius and Narses (536-53). See Goths.

The North Germans advanced from the northernmost part of the common Teutonic territory, that is, from Schleswig-Holstein, into Denmark, whence they passed to Schonen (Scania), the southernmost part of Sweden, gradually spreading from there over the Scandinavian peninsula, and the islands to the westward, especially Iceland.

The Western Continental Germans were divided by Tacitus and Pliny into three groups: the Ingvæones, who coincide with the Low German peoples along the north coast of Germany; the Istævones, corresponding to the Franconians; and the Hermiones (q.v.), corresponding to the High Germans. The principal Low German races were the Saxons, the Frisians, and the Franconians or Franks. The ancient seat of the Saxons was on the eastern side of the mouth of the river Elbe; to the north of them in Schleswig-Holstein were the Angles. In the middle of the fifth century the British King Vortigern called in the aid of the Saxon chief Hengist as a hired auxiliary. With the related Jutes (q.v.), the Saxons overran England south of the Thames; during the same century the Angles occupied Central and Northern England. To this mixture of Celts and Teutons the Norman Conquest (1066) added a new and peculiar ingredient, Teutonic as to stock, Romance as to speech and institutions. See Anglo-Saxons.

The Continental Saxons (Old Saxons), the great nation whom Charlemagne forcibly converted to Christianity, are in the first centuries after Christ the occupants of Lower Germany. At the root they are the same Saxons who together with the Angles accomplished the conquest of Britain. The Frisians are the westernmost division of the Ingvæonic Teutons. Their ancient home was on the North Sea, in the marshes found about the Zuyder Zee, and from there east as far as the river Ems.

The Franconians or Franks (q.v.) are a more modern name for the ancient Istævones. Their original home was on both sides of the middle and lower course of the Rhine.

The High German peoples coincide almost exactly with the third division of the West Germans whom Pliny calls Hermiones, Tacitus Herminones. Their territory anciently extended very much farther to the north than in mediæval and modern times. Adjoining the Saxons to the southeast dwelt the Lombards (q.v.) before they started on their long migration to Italy (568). Southwest of them were the Semni or Semnones, and due south of them the Hermunduri or Thuringians. To the west of them, along the lower course of the river Main, were the ancient seats of the Suevi (Swabians) and Alemanni. Again to the east of the Thuringians, in the present Kingdom of Bohemia and parts of Bavaria, dwelt at the beginning of our era the powerful people of the Marcomanni (q.v.). After Charlemagne's conquest of the Avars the Bavarian Marcomanni crossed the river Enns and colonized part of the present German provinces of Austria. Consult: Bremer, "Ethnographie der germanischen Stämme," in Paul, *Grundriss der germanischen Philologie*, vol. iii. (Strassburg, 1896 et seq.).

TEWFIK (Mohammed) **PASHA**, tū′fik pȧ-shä′ (1852-92). Khedive of Egypt from 1879 to 1892. He was the eldest son of Ismail Pasha, who secured from the Sultan a firman decreeing the khedival succession to Tewfik instead of his brother Halim, who would have become Khedive under the order of succession then in force. Tewfik was fond of country life, and spent most of his time before his accession on his estates. He was interested in educational matters and founded several schools. In February, 1879, when the Ministry of Nubar Pasha was dismissed (see Egypt), Prince Tewfik became president of the Council, but he, like Nubar, showed too much sympathy with Egypt's European creditors and soon retired. On June 26, 1879, the Sultan deposed Ismail and Tewfik became Khedive, at a time when Egypt was deeply embarrassed financially and the power of the Khedive was much curtailed. His general policy was modern and European, and the year 1880 witnessed the establishment of the dual control of Egypt by England and France. Tewfik soon had to face the rebellion of the Nationalists under Arabi Pasha (q.v.), and Egypt was rescued from anarchy by the intervention of England, which thereby established a controlling influence in the country. The conquest of the Sudan by the Mahdi occurred during Tewfik's reign and its recovery was not begun till after his death, which took place near Cairo, January 7, 1892. Consult Penfield, *Present Day Egypt* (New York, 1899).

TEWKESBURY, tūks'bēr-ĭ. A town and Parliamentary and municipal borough in Gloucestershire, England, on the Avon, 10 miles northeast of Gloucester (Map: England, D 5). The parish church, an ancient and noble edifice in Norman, is a noteworthy architectural feature, and there are interesting remains of a great Benedictine abbey founded in the twelfth century. Tewkesbury is famous as the scene of the battle fought within half a mile of it on May 4, 1471, when the Yorkists under Edward IV. and the Duke of Gloucester inflicted a signal defeat on the Lancastrians. Population, in 1891, 5269; in 1901, 5419. Consult: Blunt, *History of Tewkesbury* (2d ed., London, 1877); Massé, *Tewkesbury Abbey Church* (London, 1900).

TEX'ARKAN'A. The name of two adjoining cities situated on each side of the boundary between Arkansas and Texas, 145 miles southwest of Little Rock; on the Texas and Pacific, the Saint Louis, Iron Mountain and Southern, the Saint Louis Southwestern, the Kansas City, Pittsburg and Gulf, and other railroads (Map: Texas, H 3). One of the municipalities is the county seat of Miller County, Ark., and the other is in Bowie County, Texas. They form, however, practically one industrial community. There are a fine post-office building, two city halls, and Saint Agnes Academy, besides several handsome residences and business blocks. Texarkana has considerable importance in commerce and manufactures. It is the centre of large timber interests, and ships also cotton, cottonseed oil, and hides. Foundries and machine shops, various plants connected with the cotton industry, railway shops, lumber mills, and furniture and pottery factories constitute the leading industrial establishments. Population, Texarkana in Texas, in 1890, 2852; in 1900, 5256; Texarkana in Arkansas, in 1890, 3528; in 1900, 4914.

TEX'AS. A South Central State of the United States, popularly called the 'Lone Star State.' It is, next to Florida, the southernmost State of the Union, lying between latitudes 25° 51′ and 36° 30′ N., and between longitudes 93° 27′ and 106° 43′ W. It is bounded on the north by Oklahoma and Indian Territory, on the east by Arkansas and Louisiana, on the southeast by the Gulf of Mexico, on the southwest by Mexico, from which it is separated by the Rio Grande, and on the northwest by New Mexico. It is of an irregular triangular shape with the apex pointing south and a square 'panhandle' extending northward. Its greatest length from north to south is about 800 miles, and its greatest breadth about 750 miles. It is the largest State in the Union, having an area of 265,780 square miles, of which 3490 square miles constitute water surface. Its area is larger than the combined area of the Atlantic States from Maine to Virginia, inclusive, and nearly one-third greater than that of the whole German Empire.

Topography. In general the land rises gradually toward the western boundary by a succession of broad and more or less terraced slopes running parallel with the Gulf coast. Five or six well-marked topographical regions may be distinguished. The first is the coastal plain, a continuation of the same formation in the other Gulf States. It rises gradually from sea level to an altitude of 500 feet about 150 miles inland, and is very level in its lower portion, becoming somewhat hilly near its inner border. The coast itself is lined almost throughout its length of 375 miles by lagoons cut off from the sea by long, narrow sand islands. The largest and southernmost of these lagoons is the Laguna Madre, whose water is almost stagnant and very salt. The northern lagoons generally extend some distance inland in large, irregular bays and estuaries, lined partly by low marshy shores, partly by high bluffs. The principal bays are those of Galveston, Matagorda, San Antonio, and Corpus Christi. West of the coastal plain extends a belt of rolling country known as the Black Prairie, about 100 miles wide in the north and south, but very narrow in its middle portion. It is succeeded on the northwest by a very broad belt of country called by geologists the Central Denuded Region. This rises from a height of 600 feet in the east to over 2000 feet in the west, being bounded by the escarpment of the Llano Estacado, and is a rugged and much eroded, though not mountainous, region, with ridges, prairie valleys, isolated tablelands, and irregular depressions. It is bounded on the west and southwest by the Plateau Region, a southern continuation of the Great Plains. South of the 'Panhandle' this forms a large, flat-topped table-land, the Llano Estacado, which from an altitude of 4000 feet falls on the east into the Denuded Region in a high, steep, and ragged escarpment cut back by several large river valleys. On the southeast it runs out into a lower plateau of different formations known as the Grand Prairie. This sweeps around the southern end of the Denuded Region, and geologically, and according to some also topographically, it runs northward between the latter and the Black Prairie, though it is here much lower than in the south. It extends southward to the Rio Grande Valley, and is bounded on the southeast by an escarpment. The last topographical region is the portion of the State lying beyond the Pecos River in the southwest. This is a rugged mountainous country with a number of high isolated and barren ridges inclosing broad and arid valleys. The highest point is Baldy Peak, with an altitude of 8382 feet.

Hydrography. Practically all the rivers of Texas flow in parallel courses southeastward through the State. With the exception of the Canadian River in the north and the Rio Grande with the Pecos in the south, which rise in the Rocky Mountains, all the larger rivers rise on the eastern edge of the Great Plains, the Llano Estacado, and the Grand Prairie. The extreme northern part of the State belongs to the Mississippi Basin. The Canadian River crosses the Panhandle to join the Arkansas, while the Red River rises on the escarpment of the Llano Estacado and forms for a long distance part of the northern State boundary. The independent rivers flow directly to the Gulf of Mexico, and all, except the Brazos and Rio Grande, empty through estuaries into the coast lagoons. The principal rivers are the Sabine, on the Louisiana boundary, the Neches, Trinity, Brazos, Colorado, Guadalupe, San Antonio, Nueces, and the Rio Grande. Most of these rivers flow through deep cañons immediately after leaving the Great Plains. Several of them are navigable for considerable distances at high water, but their mouths are generally obstructed by bars.

Climate. As Texas reaches to within two and a half degrees of the tropical zone, it naturally has a warm climate, but the great range in latitude, and to some extent in altitude, produces also a considerable range in climatic conditions. Although warm, the climate is drier and less enervating than that of the other Gulf States. The mean temperature in July at Galveston on the coast is 83.7°, at El Paso in the extreme west 81.9°, and at Amarillo in the northwest 76°. The corresponding figures for January are 52.7° at Galveston, 44.5° at El Paso, and 31.9° at Amarillo. On the coast the temperature seldom falls below the freezing point, while in the northwest it may fall several degrees below zero. In the western uplands, on the other hand, the temperature rises above 100°, while on the coast the maximum is between 90° and 95°. In winter the State is subject to severe north winds, known as *northers*, which often lower the temperature 50° in a few hours. In the eastern section the southeast winds from the Gulf are prevalent and bring abundant rain to that part of the State. The rainfall decreases rapidly westward, so that in the western part it is insufficient for agriculture. In the eastern portion near the mouth of the Sabine River the rainfall is sometimes over 60 inches, while in the extreme south, even near the coast, it is sometimes only five inches in a year. The normal annual average at Galveston is 49 inches, at Corpus Christi 30, at Austin 34, at Abilene, nearly in the centre of the State, 25, at Amarillo in the Panhandle 22, and at El Paso 9 inches.

Soil. The alluvial bottom lands around the lower river courses are the most fertile portions of the State. Next to these ranks the Black Prairie belt, which is covered with a remarkably fertile marl formed by the mixture of clay with the disintegrated Cretaceous limestone. The soil of the coastal plain is generally sandy; in some places the sand is mixed with clay to form a black loam. In the northwest there are heavy deposits of red clay containing much potash, but little nitrogenous matter. The soil on the southern plateau is thin, but the Llano Estacado is covered with a red sandy loam which would be rendered fertile by irrigation.

Flora. The principal forest area of Texas is in the extreme eastern portion. In the sandy coastal plain the pine is the prevailing tree, long-leaf pine in the lower and short-leaf pine in the higher pine barrens. Westward toward the centre of the State the deciduous species predominate, including oaks, elm, maple, hickory, sycamore, mulberry, sweet gum, ash, and walnut. The Osage orange is also common here, and the palmetto in the eastern part lends a tropical aspect to the vegetation. In the river-bottoms the characteristic species are cottonwood, pecan, live oak, and cypress. Along the western border of the Black Prairie two parallel belts of hardwood forest, chiefly oak, and known as the Cross Timbers, extend southward as far as the Brazos River. To the south and west of these the State is practically treeless except along the river courses. There are also scattered areas of scrub and chaparral composed largely of mesquite, the most characteristic tree of western Texas. Still farther west even the prairie grasses give place to or grow in the midst of a desert flora in which the yuccas and cacti are predominant.

For Fauna, see United States; also Rocky Mountains.

Geology and Minerals. The oldest rocks of the State come to the surface in the Central Denuded Region. In the southern part of this region, west of Austin, there is a small area of Archæan rock surrounded by a narrow outcrop of Cambrian and Silurian strata. To the north of this there is a considerable area of Carboniferous formation followed on the northwest along the eastern base of the Llano Estacado by a still larger region referred by some to the Permian, by others to the Jurassic system. Another large area of Paleozoic and early Mesozoic rocks is found in the Trans-Pecos region, where the predominant formation is the Jura-Trias, with small scattered outcrops of Carboniferous and other Paleozoic, together with some recent igneous rocks. The Llano Estacado, like the Great Plains to the north, is of very recent formation, consisting of lacustrine Tertiary deposits. The southern plateau or Grand Prairie region is older, being of Lower Cretaceous formation, and this formation also skirts the central Paleozoic area on the east. It is succeeded on the east by a band of Upper Cretaceous strata constituting the Black Prairie belt. Beyond this the entire coastal plain is composed of marine Tertiary deposits. Workable beds of bituminous coal occur in the central portion of the State, and large deposits of lignite are stretched along the western border of the coastal plain. In the eastern part of the State, near the mouth of the Sabine, petroleum deposits of great extent have been found at a depth of about 1000 feet. Iron and copper ores, as well as lead and tin, occur in the southeastern part of the central region, and silver is found in the west. The Trans-Pecos region, still but partly explored, probably contains varied mineral deposits, the most important being the cinnabar ores found in the Cretaceous limestone in the south. The most important of the remaining minerals in the State are the immense beds of gypsum found in the Permian strata of the northwestern Red Lands.

Mining. Mining, which had until recently been of little importance, bids fair to acquire large proportions. The value of coal increased almost steadily from $412,300 in 1891 to $1,907,024 in 1901. In the latter year there were mined 787,700 short tons of bituminous coal and 296,681 short tons of lignite. The production of petroleum practically began in 1897. The yield has increased very rapidly, amounting to 4,393,658 barrels in 1901. The silver exploited in the same year was valued at $283,440. Brick and tile made from local clays in that year amounted to $1,632,189. Gypsum is mined in the northwestern part. Cinnabar and salt are mined and some granite, sandstone, and limestone are quarried. There are a number of valuable mineral springs.

Fisheries. In 1897 the value of the catch for the year was $237,496, this figure being less than for 1890. The oyster, trout, sheepshead, and red snapper rank in importance in the order named.

Agriculture. The enormous area of Texas with its favorable physical and climatic conditions has made it one of the leading agricultural States in the Union. In 1900 there were 125,807,017 acres, or 74.9 per cent. of the total land area, included in farms. This was three times greater than the corresponding area in any other State. But the improved area—19,576,076 acres—was not so great as in some other commonwealths. The average size of the farms, which decreased rapidly prior to 1880, has increased since that year, being 357.2 acres in 1900. The recent increase is due to the inclosure into farms of extensive pastures in the west. Thus the average size of farms or ranches in the entire State is 357.2 acres, while in Red River County it is only 50.6 acres. In 1900 there were 11,220 farms of over 1000 acres each, containing an aggregate of 88,159,247 acres. In that year 7.3 per cent. of the farms were operated by cash tenants and 42.4 by share tenants. The number of the latter almost doubled between 1890 and 1900. Considerably over one-fourth of the farms are operated by negroes, but only 26.1 per cent. of these are owned by them. The State ranks fifth in the aggregate value of farm products. Crop-raising is mainly confined to the eastern and central parts, the light rainfall in the west adapting that section better to grazing than to tillage.

While there is a great variety of crops, the State is best known for its cotton, the value of which in 1899 was $84,332,713, or over one-half the total value of all crops. In that year 27.9 per cent. of the production of the United States was grown in Texas. The acreage devoted to the crop was more than twice that for any other State and much greater than that for any country of the world. There was an increase of 80.6 per cent. between 1880-90, and 76.9 per cent. in the following decade. The main cotton belt extends northeastward from Travis County to Grayson, Fanin, and Lamar counties, though there is a secondary belt southward through Bexar County toward the Gulf. After cotton, by far the most important crop is corn. The acreage devoted to it increased 62.9 per cent. between 1890-1900. A rapid increase also has recently taken place in the raising of wheat. From twenty-second in rank in 1898 the State rose to sixth in 1900. The area devoted to oats, the only other important cereal, is also increasing. The cereals mentioned, except wheat, which is confined more to the north, are grown in nearly all parts of the State. The Gulf Coast region is well adapted to the cultivation of rice, and since 1897, in which year rice irrigation began, much progress has been made in rice culture. In 1902 the area in rice was estimated at over 200,000 acres. The greatest development has occurred in the vicinity of Beaumont and in the Colorado River Valley. The acreage in hay and forage in 1899 was 148.5 per cent. greater than ten years before. Kafir corn is grown in the more arid sections. Dry peas, potatoes, sweet potatoes, sugar cane, sorghum cane, and peanuts are other crops worthy of mention. In 1899 26,276 acres were devoted to watermelons. The number of orchard fruits increased 88.4 per cent. between 1890 and 1900. The peach trees numbered in the latter year 7,248,358 and constituted 65.7 per cent. of the total number of trees. In 1899 there were 49,652 acres irrigated, including 8 700 acres of rice in the coast counties. In the arid west, the Rio Grande and the Pecos and Nueces rivers are the chief sources of water supply. The normal flow of water in the Rio Grande has been greatly reduced through the increased use of its water farther north in New Mexico and Colorado, so that much of the area covered by ditches in El Paso County cannot be supplied with water. There are two large regions now being developed in the southwest, where artesian wells are used in irrigation.

The following table shows the increase in acreages:

CROP	1900, acres	1890, acres
Cotton	6,960,367	3,934,525
Corn	5,017,690	3,079,907
Wheat	1,027,947	352,477
Oats	847,225	528,924
Hay and forage	938,024	377,523
Kafir corn	22,813	....
Sugar cane	17,824	16,284
Sorghum cane	26,803	28,547
Rice	8,711	178
Potatoes	21,810	11,831
Sweet potatoes	43,561	52,506
Dry peas	33,947	....
Peanuts	10,734	1,560

Stock-Raising. Texas ranks second in the value of live stock, and far exceeds all other States in the number of cattle. The State is probably more widely known for its grazing interests than for any other industrial feature. There is no other part of the country in which ranching has been carried on so extensively. The use of the pasture lands has occasioned much trouble between the settlers and the ranchmen, the former violently opposing the attempts of the ranchmen to monopolize the public land by inclosing it with barbed wire fences. A number of laws have been passed protecting the interests of the settlers. The total number of cattle in 1900 was 7,279,935, not including 2,148,261 spring calves. Only one other State had half this number of cattle. The practice is extensively followed of shipping or driving the cattle into other States for market feeding.

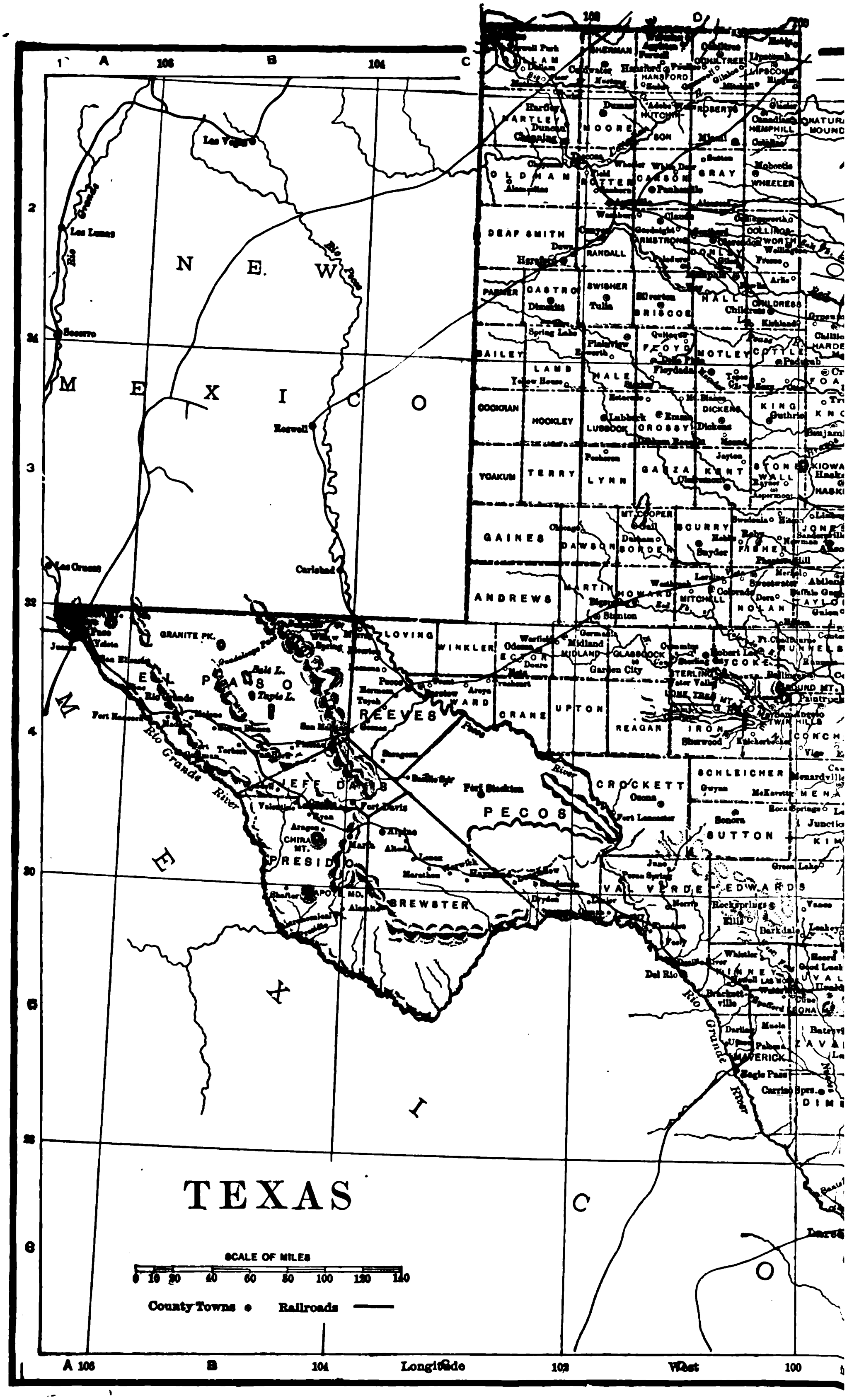
The decrease in dairy cows as shown in the table below is only apparent, being due to a change in the method of enumeration. Twice as much milk was reported in 1900 as in 1890. There has been a gain in the number of horses, mules, and swine. The State ranks first in the number of mules and third in the number of horses. The number of mules more than doubled between 1890 and 1900. However, the number of sheep decreased nearly two-thirds in the same period. Sheep-grazing seems to be giving way to cattle-raising. In the following table of holdings on farm and range, the two census years shown are not strictly comparable, since the 1890 figures do not include the number of animals on ranges separately reported, and consisting of over 2,300,000 cattle and about 800,000 sheep:

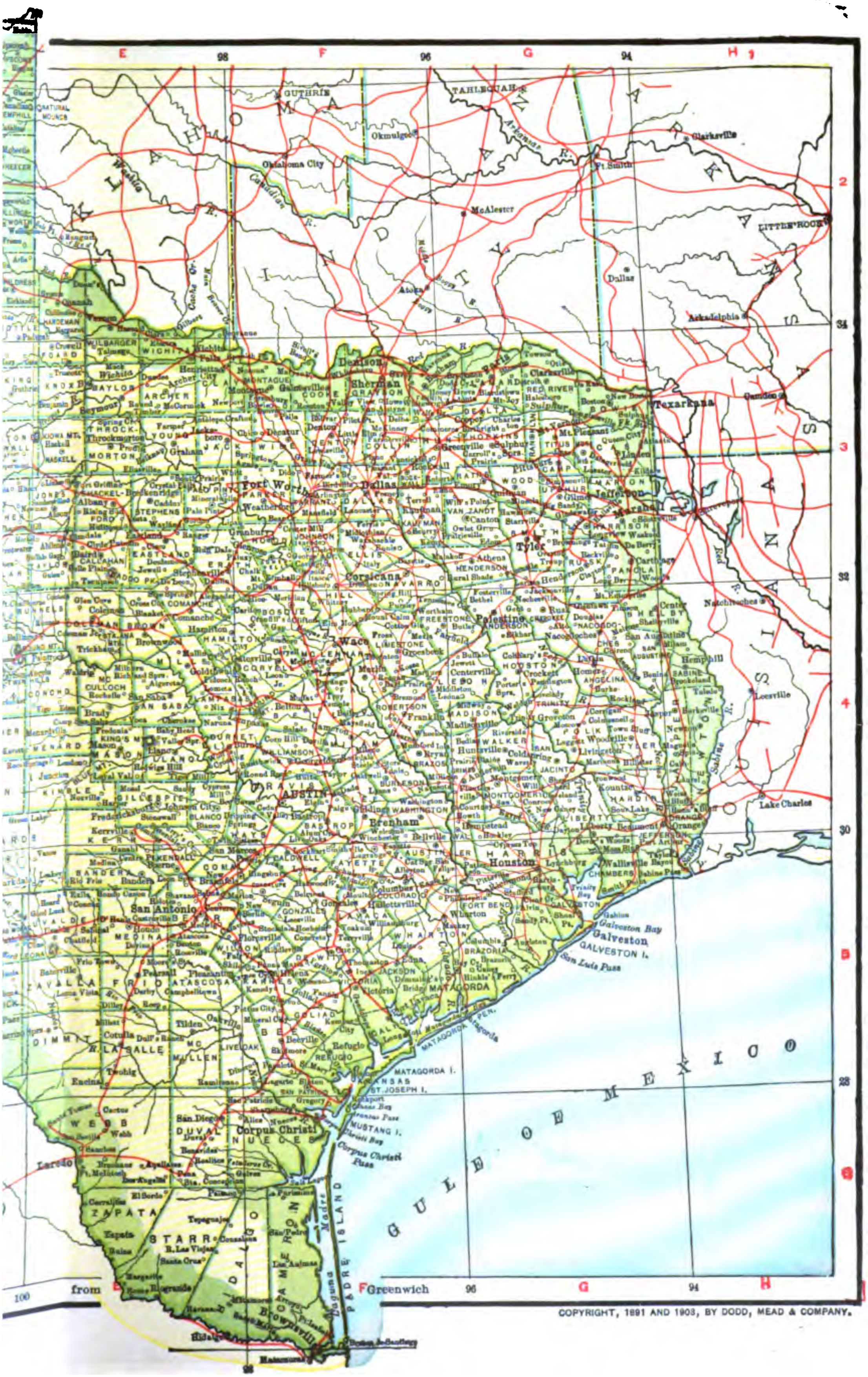
STOCK	1900	1890
Dairy cows	861,023	1,003,439
Other cattle	8,567,173	5,198,113
Horses	1,269,432	1,026,002
Mules and asses	523,690	227,432
Sheep	1,439 940	3,454,858
Swine	2,665,614	2,252,476

AREA AND POPULATION OF TEXAS BY COUNTIES.

(*Continued OVER.*)

County.	Map Index.	County Seat.	Area in square miles.	Population. 1890.	Population. 1900.
Anderson	G 4	Palestine	1,060	20,923	28,015
Andrews	C 3		1,591	24	87
Angelina	G 4	Lufkin	880	6,306	13,481
Aransas	F 6	Rockport	295	1,824	1.716
Archer	E 3	Archer City	960	2,101	2,508
Armstrong	D 1	Clande	870	944	1,205
Atascosa	E 5	Pleasanton	1,182	6.459	7,143
Austin	F 5	Bellville	712	17,859	20,676
Bailey	C 1		1,000	.....	4
Bandera	E 5	Bandera	1,007	3,795	5.332
Bastrop	F 4	Bastrop	881	20,736	26.845
Baylor	E 3	Seymour	957	2.595	3.052
Bee	F 5	Beeville	875	3,720	7.720
Bell	F 4	Belton	1,091	33,377	45,535
Bexar	E 5	San Antonio	1,268	49.266	69.422
Blanco	E 4	Johnson City	762	4,649	4,703
Borden	D 3	Gail	892	222	776
Bosque	F 4	Meridian	972	14,224	17,390
Bowie	G 3	Boston	907	20,267	26,676
Brazoria	G 5	Angleton	1,438	11,506	14.861
Brazos	F 4	Bryan	510	16,650	18,859
Brewster	C 4	Alpine	5,006	710	2.356
Briscoe	D 1	Silverton	850	......	1,253
Brown	E 4	Brownwood	911	11,421	16,019
Burleson	F 4	Caldwell	677	13,001	18.367
Burnet	F 4	Burnet	1,010	10,747	10,528
Caldwell	F 5	Lockhart	530	15,769	21,765
Calhoun	F 5	Port Labaca	592	815	2.395
Callahan	E 3	Baird	882	5,457	8,768
Cameron	F 6	Brownsville	2,203	14,424	16,0.5
Camp	G 3	Pittsburg	217	6,624	9.146
Carson	D 1	Panhandle	860	356	469
Cass	G 3	Linden	945	22,551	22,841
Castro	C 1	Dimmit	870	9	400
Chambers	G 5	Wallisville	648	2.241	3,046
Cherokee	G 4	Rusk	990	22,975	25,154
Childress	D 1	Childress	660	1,175	2,138
Clay	E 3	Henrietta	1,250	7,503	9,231
Cochran	C 3		959	.....	25
Coke	D 4	Robert Lee	850	2,059	3.430
Coleman	E 4	Coleman	1,302	6,112	10.077
Collin	F 3	McKinney	828	36,736	50,087
Collingsworth	D 1	Wellington	867	357	1,233
Colorado	F 5	Columbus	948	19.512	22,203
Comal	E 5	New Braunfels	569	6,398	7.008
Comanche	E 4	Comanche	828	15,608	23,009
Concho	D 4	Paintrock	941	1,065	1,427
Cooke	F 3	Gainesville	1,000	24,696	27,494
Coryell	F 4	Gatesville	1,115	16,873	21,308
Cottle	D 1	Paducah	956	240	1,002
Crane	C 4		850	15	51
Crockett	D 4	Ozona	3,004	194	1,591
Crosby	D 3	Emma	984	346	788
Dallam	C 1	Texline	1,463	112	146
Dallas	F 3	Dallas	900	67,042	82.726
Dawson	C 3	(Unorganized)	900	29	37
Deaf Smith	C 1	Hereford	1,477	179	843
Delta	G 3	Cooper	266	9,117	15,249
Denton	F 3	Denton	865	21,289	28.318
Dewitt	F 5	Cuero	880	14,307	21,311
Dickens	D 3	Dickens	918	295	1,151
Dimmit	D 5	Carrizo Springs	1,164	1,049	1.106
Donley	D 1	Clarendon	878	1,056	2.756
Duval	E 6	San Diego	1,887	7,598	8,483
Eastland	E 3	Eastland	947	10,378	17,971
Ector	C 4	Odessa	976	224	381
Edwards	D 4	Rocksprings	2,408	1,970	3,106
Ellis	F 3	Waxahachie	1,066	31,774	50,059
El Paso	B 4	El Paso	9,353	15.678	24,886
Encinal	......	(Unorganized)	.....	2,744	......
Erath	E 3	Stephenville	1,110	21,594	29,966
Falls	F 4	Marlin	844	20,706	33,342
Fannin	F 3	Bonham	940	38,709	51,793
Fayette	F 5	Lagrange	992	31,481	36,542
Fisher	D 3	Roby	886	2,996	3,708
Floyd	D 1	Floydada	1 036	529	2,020
Foard	E 3	Crowell	636	......	1,568
Fort Bend	G 5	Richmond	897	10,586	16,538
Franklin	G 3	Mount Vernon	325	6,481	8,674
Freestone	F 4	Fairfield	947	15,987	18,910
Frio	E 5	Pearsall	1,064	3,112	4,200
Gaines	C 3		1,590	68	55
Galveston	G 5	Galveston	438	31,476	44,116
Garza	D 3		821	14	185
Gillespie	E 4	Fredericksburg	1,140	7,056	8,229
Glasscock	D 4	Garden City	952	208	286
Goliad	F 5	Goliad	817	5.910	8,310
Gonzales	F 5	Gonzales	1,079	18,016	28,882
Gray	D 1	(Unorganized)	860	203	480
Grayson	F 3	Sherman	1,012	53,211	63,661
Gregg	G 3	Longview	287	9,402	12,343
Grimes	G 4	Anderson	770	21,312	26,106
Guadalupe	F 5	Seguin	717	15,217	21.385
Hale	D 3	Plainview	1.036	721	1,680
Hall	D 1	Memphis	868	703	1,670
Hamilton	E 4	Hamilton	858	9,318	13,520
Hansford	D 1	Hansford	860	133	167
Hardeman	E 1	Guanah	582	3,904	3.634
Hardin	G 4	Kountze	844	3,956	5,049
Harris	G 5	Houston	1,761	37.249	63,786
Harrison	G 3	Marshall	873	26,721	31,878
Hartley	C 1	Channing	1,460	252	377
Haskell	E 3	Haskell	843	1,665	2,637
Hays	F 4	San Marcos	647	11,352	14,142
Hemphill	D 2	Canadian	860	519	815
Henderson	G 3	Athens	940	12,285	19,970
Hidalgo	E 6	Hidalgo	2,328	6,534	6,837
Hill	F 4	Hillsboro	1,006	27,583	41,355
Hockley	C 3		977	......	44
Hood	F 3	Granbury	436	7,614	9,146
Hopkins	G 3	Sulphur Springs	666	20,572	27,950
Houston	G 4	Crockett	1,192	19,360	25,452
Howard	D 3	Bigspring	888	1,210	2,528
Hunt	F 3	Greenville	888	31,885	47,295
Hutchinson	D 1	Plemmons	850	58	303
Irion	D 4	Sherwood	800	870	848
Jack	E 3	Jacksboro	858	9,740	10,224
Jackson	F 5	Edna	888	3,281	6,094
Jasper	H 4	Jasper	977	5,592	7,138
Jeff Davis	B 4	Fort Davis	1,922	1,394	1,150
Jefferson	G 5	Beaumont	1,109	5.857	14,239
Johnson	F 3	Cleburne	740	22,313	33,819
Jones	E 3	Anson	900	3,797	7,053
Karnes	F 5	Karnes City	740	3,637	8,681


TEXAS
SCALE OF MILES
0 10 20 40 60 80 100 120 140
County Towns ●
Railroads
Longitude West
A 106 B 104 102 100
A 106 B 104 C
1 2 3 4 5 6
34 32 30 28
NEW MEXICO
MEXICO
Las Vegas
Los Lunas
Socorro
Roswell
Carlsbad
Las Cruces
Rio Grande
Rio Pecos
Rio Grande River
SHERMAN
HANSFORD
OCHILTREE
LIPSCOMB
HARTLEY
MOORE
HUTCHINSON
ROBERTS
HEMPHILL
OLDHAM
POTTER
CARSON
GRAY
WHEELER
DEAF SMITH
RANDALL
ARMSTRONG
DONLEY
COLLINGSWORTH
PARMER
CASTRO
SWISHER
BRISCOE
HALL
CHILDRESS
BAILEY
LAMB
HALE
FLOYD
MOTLEY
COTTLE
HARDEMAN
COCHRAN
HOCKLEY
LUBBOCK
CROSBY
DICKENS
KING
YOAKUM
TERRY
LYNN
GARZA
KENT
STONEWALL
GAINES
DAWSON
BORDEN
SCURRY
FISHER
ANDREWS
MARTIN
HOWARD
MITCHELL
NOLAN
TAYLOR
LOVING
WINKLER
ECTOR
MIDLAND
GLASSCOCK
STERLING
COKE
RUNNELS
EL PASO
REEVES
WARD
CRANE
UPTON
REAGAN
IRION
TOM GREEN
CONCHO
JEFF DAVIS
PECOS
CROCKETT
SCHLEICHER
MENARD
SUTTON
KIMBLE
PRESIDIO
BREWSTER
VAL VERDE
EDWARDS
KINNEY
UVALDE
ZAVALA
MAVERICK
DIMMIT
Amarillo
Canyon
Hereford
Dimmitt
Tulia
Plainview
Lubbock
Snyder
Big Spring
Colorado
Sweetwater
Abilene
Midland
Odessa
Pecos
Toyah
San Angelo
Sterling City
Garden City
El Paso
Ysleta
Fort Hancock
Sierra Blanca
Van Horn
Valentine
Marfa
Fort Davis
Alpine
Marathon
Sanderson
Fort Stockton
Ozona
Sonora
Del Rio
Brackettville
Eagle Pass
Junction
Rocksprings
GRANITE PK.
CHINATI MT.
Salt L.
Rio Grande River



COPYRIGHT, 1891 AND 1903, BY DODD, MEAD & COMPANY.

POPULATION OF TEXAS BY COUNTIES.

(OVER.)

Kaufman	F 3	Kaufman	932	21,598	33,376
Kendall	E 5	Boerne	613	3,826	4,103
Kent	D 3	Clairemont	777	324	899
Kerr	E 4	Kerrville	1,210	4,462	4,980
Kimble	E 4	Junction	1,302	2,243	2,503
King	D 3	Guthrie	928	173	490
Kinney	D 5	Brackettville	1,269	3,781	2,447
Knox	E 3	Benjamin	947	1,134	2,322
Lamar	G 3	Paris	908	37,302	48,627
Lamb	C 3		1,021	4	31
Lampasas	E 4	Lampasas	755	7,584	8,625
Lasalle	E 5	Cotulla	1,707	2,139	2,303
Lavaca	F 5	Hallettsville	992	21,887	28,121
Lee	F 4	Giddings	666	11,952	14,595
Leon	G 4	Centerville	1,066	13,841	18,072
Liberty	G 4	Liberty	1,162	4,230	8,102
Limestone	F 4	Groesbeck	987	21,678	32,573
Lipscomb	D 1	Lipscomb	850	632	700
Live Oak	E 5	Oakville	1,123	2,055	2,268
Llano	E 4	Llano	977	6,772	7,301
Loving	C 4		873	3	33
Lubbock	D 3	Lubbock	982	33	293
Lynn	D 3		821	24	17
McCullough	E 4	Brady	1,110	3,217	3,960
McLennan	F 4	Waco	1,080	39,204	59,772
McMullen	E 5	Tilden	1,180	1,038	1,024
Madison	G 4	Madisonville	488	8,512	10,432
Marion	G 3	Jefferson	384	10,862	10,754
Martin	C 3	Stanton	900	264	332
Mason	F 4	Mason	968	5,180	5,573
Matagorda	G 5	Bay City	1,135	3,985	6,097
Maverick	D 5	Eagle Pass	1,332	3,698	4,066
Medina	F 5	Hondo	1,284	5,730	7,783
Menard	E 4	Menardville	888	1,215	2,011
Midland	C 4	Midland	972	1,033	1,741
Milam	F 4	Cameron	1,044	24,773	39,666
Mills	E 4	Goldthwaite	604	5,493	7,851
Mitchell	D 3	Colorado	807	2,059	2,855
Montague	F 3	Montague	976	18,863	24,800
Montgomery	G 4	Conroe	1,066	11,765	17,067
Moore	C 1	Dumas	885	15	209
Morris	G 3	Daingerfield	278	6,580	8,220
Motley	D 1	Matador	984	139	1,257
Nacogdoches	G 4	Nacogdoches	962	15,984	24,663
Navarro	F 3	Corsicana	1,136	26,373	43,374
Newton	H 4	Newton	903	4,650	7,282
Nolan	D 3	Sweetwater	828	1,573	2,611
Nueces	F 6	Corpus Christi	2,460	8,093	10,439
Ochiltree	D 1	Ochiltree	864	198	267
Oldham	C 1	Tascosa	1,470	270	349
Orange	H 4	Orange	892	4,770	5,905
Palo Pinto	E 3	Palo Pinto	971	8,320	12,291
Panola	G 3	Carthage	814	14,328	21,404
Parker	F 3	Weatherford	888	21,682	25,823
Parmer	C 1	(Unorganized)	873	7	34
Pecos	C 4	Fort Stockton	8,312	1,326	2,360
Polk	G 4	Livingston	1,110	10,332	14,447
Potter	C 1	Amarillo	874	849	1,820
Presidio	B 4	Marfa	3,970	1,698	3,673
Rains	G 3	Emory	252	3,909	6,127
Randall	C 1	Canyon	872	187	963
Red River	G 3	Clarksville	1,061	21,452	29,893
Reeves	C 4	Pecos	2,610	1,247	1,847
Refugio	F 5	Refugio	802	1,239	1,641
Roberts	D 1	Miami	860	326	620
Robertson	F 4	Franklin	913	26,506	31,480
Rockwall	F 3	Rockwall	171	5,972	8,531
Runnels	E 4	Ballinger	1,073	3,193	5,379
Rusk	G 3	Henderson	915	18,559	26,099
Sabine	H 4	Hemphill	577	4,969	6,394
San Augustine	G 4	San Augustine	570	6,688	8,434
San Jacinto	G 4	Coldspring	636	7,360	10,277
San Patricio	F 5	Sinton	700	1,312	2,372
San Saba	E 4	San Saba	1,150	6,641	7,569
Schleicher	D 4	El Dorado	1,355	155	515
Scurry	D 3	Snyder	821	1,415	4,158
Shackelford	E 3	Albany	926	2,012	2,461
Shelby	G 4	Center	814	14,365	20,452
Sherman	C 1	Coldwater	850	84	104
Smith	G 3	Tyler	983	28,324	37,370
Somervell	F 3	Glenrose	200	3,419	3,498
Starr	E 6	Rio Grande	2,510	10,749	11,469
Stephens	E 3	Breckenridge	926	4,926	6,466
Sterling	D 4	Sterling City	821	......	1,127
Stonewall	D 3	Rayner	777	1,024	2,183
Sutton	D 4	Sonora	1,517	658	1,727
Swisher	C 1	Tulia	850	100	1,227
Tarrant	F 3	Forth Worth	900	41,142	52,376
Taylor	E 3	Abilene	900	6,957	10,499
Terry	C 3		828	21	48
Throckmorton	F 3	Throckmorton	821	902	1,750
Titus	G 3	Mount Pleasant	421	8,190	12,292
Tom Green	D 4	San Angelo	2,553	5,152	6,804
Travis	F 4	Austin	1,036	36,322	47,386
Trinity	G 4	Groveton	704	7,648	10,976
Tyler	G 4	Woodville	923	10,877	11,899
Upshur	G 3	Gilmer	587	12,695	10,266
Upton	C 4	(Unorganized)	1,190	52	48
Uvalde	E 5	Uvalde	1,579	3,804	4,647
Valverde	D 4	Delrio	3,034	2,874	5,263
Van Zandt	G 3	Canton	877	16,225	25,481
Victoria	F 5	Victoria	883	8,737	13,678
Walker	G 4	Huntsville	754	12,874	15,813
Waller	G 5	Hempstead	510	10,888	14,246
Ward	C 4	Barstow	858	77	1,451
Washington	F 4	Brenham	568	29,161	32,931
Webb	E 6	Laredo	3,421	14,842	21,851
Wharton	F 5	Wharton	1,137	7,584	16,942
Wheeler	D 1	Mobeetie	851	778	626
Wichita	E 3	Wichita Falls	606	4,831	5,806
Wilbarger	E 3	Vernon	932	7,092	5,759
Williamson	F 4	Georgetown	1,169	25,909	38,072
Wilson	E 5	Floresville	784	10,655	13,961
Winkler	C 4		888	18	60
Wise	F 3	Decatur	843	24,134	27,116
Wood	G 3	Quitman	688	13,932	21,048
Yoakum	C 3	(Unorganized)	840	4	26
Young	E 3	Graham	821	5,049	6,540
Zapata	E 6	Carrizo	1,269	3,562	4,760
Zavalla	E 5	Batesville	1,328	1,097	792

Manufactures. Manufacturing was quite unimportant until after 1880. Between that year and 1890 the value of products increased 239.9 per cent., and in the following decade 69.5 per cent.; in 1900 the product was estimated at $119,414,982. In the latter year there were 48,152 persons employed as wage-earners, or 1.6 per cent. of the total population. The industry has the advantage of a very abundant supply of raw materials, the State ranking first in the production of cotton, and having large timber resources and a heavy production of grain. The recent increase in the output of coal also greatly subserves the industry. Texan manufactures dependent upon resources of cotton are peculiar in that they do not include textiles, a branch of the industry which has become prominent in some other Southern States. In the manufacture of cottonseed oil and cake, on the other hand, the State ranks first. The value of products for the latter industry increased 329.3 per cent. between 1890 and 1900. During the last census year there were 24,354,695 gallons of cottonseed oil obtained, or 26.1 per cent. of the total for the United States for that period. Cottonseed meal and cake are extensively used as food for cattle. In the allied industry of cotton-ginning the State also ranks first. The figures given in the table below do not include ginneries operated in connection with saw, grist, and cottonseed-oil mills, or for the use exclusively of plantations on which they are located. The Texas ginneries first introduced the custom of pressing the cotton after ginning into the so-called 'round bales,' and this process is becoming very general. The manufacture of flouring and grist mill products is a growing industry, drawing its supply from Oklahoma and the Indian Territory as well as from the large local production. The extensive railroad interests of the State have necessitated a large number of repair shops, employing 2354 wage-earners. The manufacture of saddlery and harness is a thriving industry centred largely in the city of Dallas. Printing and the manufacture of malt liquors and of clay products are other leading industries. Manufacturing is well distributed over that State and there are no prominent centres, the only cities in which the value of products exceeds $10,000,000 being Dallas and Houston. The following table shows the relative importance of the leading industries in the census years indicated:

INDUSTRIES	Year	Number of establishments	Average number wage-earners	Value of products, including custom work and repairing
Total for selected industries for State	1900	5,793	30,119	$73,024,636
	1890	2,503	21,737	43,189,273
Increase, 1890 to 1900	......	3,290	8,382	$29,835,363
Per cent. of increase	......	131.4	38.6	69.1
Per cent. of total of all industries in State	1900	47.1	62.5	61.2
	1890	47.5	62.5	61.3
Cars and general shop construction and repairs by steam railroad companies	1900	56	6,633	$8,314,691
	1890	31	2,354	2,860,235
Clay products—total	1900	171	1,859	1,212,266
	1890	143	2,072	1,311,270
Brick and tile	1900	143	1,579	1,020,205
	1890	124	1,956	1,214,690
Pottery, terra cotta, and fire-clay products	1900	28	280	192,061
	1890	19	116	96,580
Cotton, ginning	1900	3,222	4,295	5,886,923
	1890	572	2,440	1,172,298
Flouring and grist-mill products	1900	289	705	12,333,730
	1890	690	1,626	9,903,455
Foundry and machine shop products	1900	99	1,343	2,682,426
	1890	59	782	1,874,059
Liquors, malt	1900	9	585	2,689,606
	1890	7	401	1,702,087
Lumber and timber products	1900	637	7,924	16,296,473
	1890	314	7,485	11,942,566
Lumber, planing mill products, including sash, doors, and blinds	1900	76	657	1,605,297
	1890	62	949	2,700,941
Oil, cottonseed and cake	1900	103	2,478	14,005,324
	1890	13	866	3,262,596
Printing and publishing—total	1900	772	2,547	4,577,110
	1890	447	2,069	3,971,410
Book and job	1900	118	718	1,189,700
	1890	56	469	1,213,888
Newspapers and periodicals	1900	654	1,829	3,387,410
	1890	391	1,600	2,757,522
Saddlery and harness	1900	359	1,093	3,420,790
	1890	165	693	2,488,356

Forests and Forest Products. There are valuable forests in the eastern part of the State, but to the westward they become inferior and finally give way entirely. While the wooded area is estimated at 64,000 square miles, or 24 per cent. of the total area, the timber upon much of this is fit for little else than fire wood. From Texarkana southward to a point about 100 miles north of Beaumont are forests of short-leaf pine of only moderate quality. From this point southward to Jefferson County is a fine forest of long-leaf pine, having an average stand of merchantable timber ranging from 6000 to 35,000 feet per acre. The lumber industry, which had developed but little prior to 1880, has since made rapid strides. (See table above.) The crop consists almost entirely of yellow pine. The Beaumont and Orange districts are the largest centres of the industry.

Transportation and Commerce. The railroads had developed but little prior to 1870, in which year there were 711 miles. In 1880 the mileage had increased to 3244, in 1890 to 8709, and in 1900 to 9991. Only two other States had a greater mileage in 1900. The eastern part of the State is well supplied with both east and west and north and south lines, many of them making connection with important trunk lines. The Southern Pacific, Texas Pacific, and Colorado Southern pass westward through the State, but there are large areas in western and southern Texas quite unpenetrated. There is a Railroad Commission, which is authorized to adopt all necessary rates, charges, and regulations; to govern and regulate traffic; to correct abuses and prevent unjust discrimination and extortion; to classify and subdivide freight, etc. The Commission has been unusually successful. It has done much to prevent pooling, and has recovered for the State a considerable area of land. The long coast line gives the State the advantage of a number of good harbors and a direct foreign trade. The customs districts are Galveston, Corpus Christi, Saluria, Paso del Norte, and Brazos de Santiago. Most of the foreign trade passes through these districts, and Galveston has become the second largest Gulf port and the sixth largest port in the United States. In 1901 the foreign trade through this port, consisting almost wholly of exports, amounted to $102,811,101.

Banks. Only one bank was chartered during the life of the Republic of Texas. In 1838 an effort was made to establish a national bank, with $7,000,000 to be borrowed in France, but the negotiations broke off. The Constitution of 1845, adopted after the admission of Texas into the Union, prohibited the creation of new banks. The necessary banking business was performed by the one existing bank and by private bankers. When after the Civil War the 'reconstruction' forces came in, a new Constitution was adopted which did not have this prohibitory clause, and in 1871 a free banking law was passed. Five or six banks availed themselves of this law, but after the reconstructionists were overthrown and 'home rule' again established, the old prohibitory rule was again included in the Constitution of 1875. The few State banks continued a long time, but had gone out of business by the end of the century. Because of this prohibition, national banks reached a high degree of development, and their number rapidly increased. In 1866 there were four national banks. By 1890 there were 189 national banks, and by 1902 the number grew to 339, with a capital of $25,261,000; surplus, $7,967,000; cash, etc., $9,373,000; deposits, $74,042,000; and loans, $80,755,000. There are a number of private banks, but the State takes no official cognizance of them.

Finances. The fiscal history of the Republic of Texas was mainly a record of debts, as the strained relations with Mexico demanded a greater expense than the taxable property of the young Republic could bear. The issue of loans was only stopped by the inability to float them. An investigation by the Legislature of the State in 1848 ascertained the nominal debt to be $9,647,253, to which the value of $4,807,764 was assigned, as Texas decided to redeem its debt at its actual value when issued. By 1850 the nominal amount and assigned value of the debt were respectively $12,322,443 and $6,818,798. The sum of $10,000,000 which the State received from the Federal Government canceled the debt and left a surplus. By 1856 there was no State debt, and the surplus was over $1,000,000. Several loans were made during the Civil War, but the war debt was repudiated by the first 'reconstruction' Legislature. The disarranged condition of the finances necessitated the issue of new bonds in 1870 and the following years. Six railroad companies were assisted by loans aggregating $2,000,000. By 1875 there was a debt of $4,644,000. But the overthrow of the reconstruction forces in 1875 caused a radical change in the financial policy of the State. The Constitution of that date prohibited any further issue of bonds, except for war purposes, as well as the lending of the State's credit to private enterprises. Because of the difficulty of paying the interest, the debt continued to grow for some time and in 1880 reached its maximum of $5,566,928, after which it steadily declined. The policy of the State has been to buy its own bonds for investment of the school and university funds. The income of the State is derived mainly from a general property tax and sale and lease of public land. Total receipts in 1902 amounted (as far as can be calculated from the accounts of 30 different funds) to about $8,744,000, and disbursements to about $7,104,000. The cash balance was $2,200,000.

Government. The Constitution now in operation was adopted by the constitutional convention held in 1875. An amendment in order to become a part of the Constitution must receive a two-thirds vote of the members elected to each House, and a majority vote of the State electors voting at a popular election.

Voters must have resided one year in the State and six months in the district where the vote is cast; and if financial measures are voted upon, taxpayers alone are allowed to vote. The suffrage is denied to soldiers, marines, and seamen employed in the service of the army or navy of the United States.

Legislative. Senators are elected from districts of contiguous territory for terms of four years, and are limited to 31 in number. Representatives are elected for terms of two years from counties or districts of contiguous counties according to population, being apportioned one to every 15,000 inhabitants, provided the number should never exceed 150. The Legislature meets biennially at a time provided by law and at such other times as the Governor may demand. If any member removes his residence from the district or county for which he was elected, his office becomes vacant. The compensation of members cannot exceed $5 per day for the first 60 days of each session, nor $2 per day for the remainder of the session in addition to mileage.

Executive. A Governor, Lieutenant-Governor, Secretary of State, Comptroller, Treasurer, Commissioner of the General Land Office, and Attorney-General are elected for a term of two years. The Lieutenant-Governor and president pro tem. of the Senate are in the line of succession to the Governorship in case of vacancy in the office of Governor. The Governor may veto any bill or portion of any appropriation bill, but a two-thirds vote of each House overcomes the veto. The Governor grants reprieves, commutations, and pardons, and under regulations remits fines and forfeitures.

Judicial. The Supreme Court consists of a Chief Justice and two associate justices, who are elected for six years. The Court of Criminal Appeals consists of three judges, also elected for six years. The State is divided into judicial districts, in each of which a judge is elected for a term of four years. Each county elects a county judge who serves for two years.

Texas has sixteen Representatives in the Lower House of the National Congress. The capital is Austin.

Population. The following figures show the growth of the population: 1850, 212,592; 1860, 604,215; 1870, 818,579; 1880, 1,591,749; 1890, 2,235,523; and 1900 3,048,710. From twenty-fifth in rank in 1850, Texas advanced to sixth in 1900. The per cent. of gain from 1890 to 1900 was 36.4, which was much greater than that for any other of the more populous States of the Union. The bulk of the population is confined to the eastern half of the State. The average density in 1900 was 11.6, as against 25.6 for the Union. Texas has received a much larger number of immigrants than any other Southern State. The foreign-born numbered 179,357 in 1900. The negroes numbered 620,722, the rate of gain between 1890 and 1900 (27.2 per cent.) being less than that for the whites. There were 36 cities in 1900 having over 4000 inhabitants each, the aggregate population of which amounted to 14.9 per cent. of the total population. The cities with more than 10,000 inhabitants were: San Antonio, 53,321; Houston, 44,633; Dallas, 42,638; Galveston, 37,789; Fort Worth, 26,688; Austin, 22,258; Waco, 20,686; El Paso, 15,906; Laredo, 13,429; Denison, 11,807; and Sherman, 10,243.

Religion. The Baptists are numerically the strongest Church, followed closely by the Methodist. These two bodies together contain considerably over two-thirds of the church membership. The Disciples of Christ (Christian), Presbyterians, and Episcopalians are the only other Protestant sects numerically important.

Education. The per cent. of illiteracy is not nearly so great as in most Southern States, being, in 1900, 14.5 of the total population ten years of age and over—whites 6.1 and blacks 36.0. The State is exceptional among the States of the South in that the public schools have a heavy endowment—a fact largely responsible for its educational progress. In September, 1902, the permanent school fund aggregated $42,563,229. Of this, $10,638,951 was represented by bonds; $15,549,277 by land notes; $16,250,000 by school lands; and $125,000 by cash. There was a county permanent school fund in August, 1902, aggregating $6,596,506, of which nearly $2,000,000 represented lands held by the counties. The permanent free school fund had in 1902 received from the State a total of 43,986,131 acres of land, of which 22,080,225 acres were still unsold. In addition to the State endowment, each county has an independent endowment of four leagues of land. The Governor's report of 1903 estimated the State receipts for public schools for the fiscal year at $3,881,190, the sources of which were the ad valorem tax of 18 cents on the $100, one-quarter of all occupation taxes, the poll tax ($1), the interest in bonds and notes, and the land rentals. This was supplemented in the counties by the receipts from their own school lands; and many districts also levied local school taxes. The total receipts for the year ending August, 1902, was $6,021,830, and the expenditures on public schools, $4,599,630. There is a striking difference in the condition of schools in different localities. There are two distinct forms of school organization. Thirty-three of the 224 counties retain a form of organization known as the community system, under which there are no metes and bounds to a school community, and therefore no local school tax can be imposed. The school community is organized *de novo* each year. This system was applied tentatively to all counties after the adoption of the present Constitution. Under it the schools are often too small, and since there are no local taxes, the school buildings are usually rented. A law of 1884, providing for districting the counties, is gradually being applied. This district system has a continuous board of trustees chosen by the people, and makes possible the levying of local taxes. Cities and towns may be constituted independent districts with the right to levy a tax of 50 cents on the $100 for the maintenance of public schools, and may vote a bonded debt for buildings, whereas the latter right is not allowed the rural districts, and this tax levy is limited to 22 cents on the $100.

In 1900 there were 261 independent school districts, 100 of which were municipal corporations. High-schools are common in the towns, and in 1899 there were 150 schools whose graduates could enter the State University without examination. There is a uniform text-book law which applies generally, except to cities of 10,000 inhabitants and over. The scholastic population in 1901 was 729,217, the enrollment 571,786, and the average attendance 383,900. There are over 1500 teachers, more than half of whom hold State certificates, a large number of the certificates being for life. To enable teachers better to qualify themselves, the State provides summer normal schools with a term of four weeks, there being, in 1900, 118 such schools, with an aggregate attendance of 5100. The regularly maintained State normal schools are at Denton, Detroit, Huntsville, and Prairie View. The State receives aid from the Peabody fund. The State University is located at Austin, with a medical branch at Galveston, and the Agricultural and Mechanical College at Bryan. There are a large number of denominational institutions, among which are the Polytechnic College (Methodist Episcopal South), Fort Worth; Southwestern University (Methodist Episcopal South), Georgetown; Texas Christian University (Christian), Hermosa; and Baylor University (Baptist), at Waco. There are a number of colleges for colored students.

Charitable and Penal Institutions. The State insane asylums are at Austin, San Antonio, and Terrell, and had a total of 3145 inmates on December 1, 1902. It is claimed that there are no insane persons in jails or poor farms. The Deaf and Dumb Asylum (school) at Austin had 450 pupils in December, 1902. On the same date the Blind Asylum (school) had 168 pupils, and the Deaf, Dumb and Blind Asylum (school) for Colored Youths, in August, 1902, 94 pupils. Both of these institutions are located at Austin, as is also the Confederate Soldiers' Home. The State Orphans' Home at Corsicana contains 308 children. In 1899 a colony for epileptics was authorized to be established at Abilene. There is a purchasing agent who secures supplies for all the eleemosynary institutions, and the cost of maintenance has been greatly reduced since the creation of this office.

The old system of leasing convicts is being abolished, and the convict farm system has developed in its stead. The State owns two large farms for male convicts and smaller ones for female convicts and consumptive convicts. Convicts are also worked upon other than State farms according to the share rent system. Others are leased to farmers or for railroad work. From 2000 to 2500 convicts are annually employed upon share or contract farms, and about 400 upon the State farms. The State penitentiaries are located at Huntsville and Rusk. The total number of convicts October, 1900, was 4109. The penal system is ordinarily self-sustaining. The reformatory at Gatesville receives penal offenders under seventeen years of age.

Militia. The population of militia age, in 1900, numbered 599,221; the organized militia, in 1901, 3080.

History. The first Europeans to tread the soil of Texas were in all probability Cabeça de Vaca and three other survivors of the Narvaez expedition of 1528. (See Nuñez Cabeça de Vaca.) Cabeça de Vaca's account of his wanderings through Texas stimulated Mendoza, the Viceroy of Mexico, to send a party northward under Friar Marcos de Niza to search for the mythical Cibola or Seven Cities, rumored to be golden as Mexico. It returned empty-handed, as did an expedition led by Vasquez de Coronado (q.v.). Several other expeditions probably penetrated Texas during the next hundred years, notably those of Espejo in 1582, Sosa in 1590, and Governor Oñate of New Mexico in 1601 and in 1611. An *entrada* in 1650, led by Capt. Hernán Martin and Diego del Castillo, is said to have reached the Tejas (Texas) tribe of Indians in the region of the Neches and Sabine; and one in 1684 under Padre Nicolás Lopez and Capt. Juan Domingo de Mendoza crossed the Rio Grande into the Pecos country. The first town in the State, lying 12 miles north of El Paso, was founded in 1682 and called Taleta.

The history of the State practically begins in 1685 with the landing of La Salle (q.v.), and though his attempt at colonization ended in failure, the Spaniards took fright, fearing that France might seize the land. In 1690 Alonzo de Leon and Padre Manzanet were sent to found a mission in that quarter, which was to serve the double purpose of holding the country and of converting the natives to Christianity. Mission San Francisco de los Tejas was accordingly founded among the Tejas Indians not far from the Neches River. The next year another expedition came out under Teran, but nothing resulted, and for years after Teran's *entrada* no further attempts were made by the Spaniards to occupy Texas. However, French activity in Louisiana roused them. In 1714 Juchereau de Saint-Denis, a bold French trader, led an expedition across the country to the Rio Grande, where he was made prisoner and sent to Mexico City. His account of Texas fired the Viceroy and Council to renew their efforts to occupy the country. In 1716 Captain Domingo Ramón was chosen to lead an expedition which founded several missions. He settled San Antonio de Bejar, which in the course of time became the centre of the most prosperous group of missions in the Province of Texas, as it was now called, the name of the original settlement among the Tejas Indians having come to be applied to the whole region.

For a half century mission founding went on, but it became early apparent that failure was certain. Most of the establishments were abandoned, and some of them were moved about in the wilderness. The Indians themselves destroyed more than one mission. When, in 1763, France surrendered Louisiana to his Catholic Majesty, the prime reason for the occupation of Texas no longer existed, as there could be no further French aggression from Louisiana. So the missions in the region of the Neches and Sabine were abandoned, and only those about San Antonio de Bejar—Alamo, Concepción, San José, Espada—showed any signs of surviving. There came in time to be three main foci of settlements—at Nacogdoches in the east; at what is now Goliad in the south; and at San Antonio de Bejar in the southwest. The latter completely overshadowed the others in importance.

In 1799 Philip Nolan, an American, invaded the country from Louisiana with a small party for the ostensible purpose of purchasing horses. Two years later on a second expedition the Spaniards attacked the adventurers, killing some and shipping the rest off to the mines of Mexico. This, however, was the beginning of the end of the Spanish régime. After the purchase of Louisiana in 1803, the people of the United States, and especially the inhabitants of the Southwest, looked upon Texas as part of the destined dominion of the Republic and never lost an opportunity to strike at the Spanish power. Indeed, in 1806 it looked as though war must result with Spain over the possession of the region. The United States claimed westward to the Rio Grande on the strength of the French occupation; Spain as stoutly disputed the claim, and in October, 1806, armies of the two powers stood facing each other across the Sabine. However, Gen. James Wilkinson, who commanded the Americans, was glad of the opportunity given him by the retreat of the Spaniards to the west of the Sabine and by the excitement attending the rumored conspiracy of Aaron Burr to make a neutral ground treaty with the opposing commander, Herrera, which practically conceded to Spain the territory west of the Sabine.

In 1810, when the great revolution in Mexico against Spain had begun, the Southerners sympathized intensely with the natives, and before very long were lending secret aid to Mexico. A filibustering expedition into Texas was led by James Long, a Natchez merchant and ex-officer in the United States Army. At Nacogdoches Texas was declared a republic and a provisional government organized; but the Spanish forces soon broke it up. For several years the coast of Texas became a rendezvous for pirate and adventurer. Louis de Aury, Captain Perry, General Mina, and Lafitte are best known. They made Galveston Island their headquarters. From here sailed the famous Mina on his expedition against the Spaniards in Mexico; and from here Lafitte the pirate scoured the Gulf till the United States Government broke up the settlement. The first score of years of the nineteenth century witnessed the expiration of the Spanish power in Texas. What with the filibustering expeditions and hostile Apaches and Comanches, and the great struggle for independence in Mexico, the Spanish foci of civilization were all but extinguished. When the harsh Spanish law which forbade the entry of Americans into the region could no longer be enforced, the frontiersmen from Kentucky, Tennessee, and Louisiana wandered in with their families. They came to stay.

In 1821 Moses Austin secured from the Mexican Government the right to establish a colony in Texas. He died soon after, but his son Stephen took up the work. Being free to choose the location for his colony, Austin selected the lower Brazos and Trinity valleys. Before long many *empresarios* had been granted, plastering over with claims the whole region from the Sabine to the Nueces. Discontent with the Mexican rule was not long in appearing. This reached a crisis on December 16, 1826. The struggle which ensued is known as the Fredonian War. A band of dissatisfied Americans, headed by Benjamin Edwards, proclaimed the eastern part of the State an independent republic with Nacogdoches as its capital. A skirmish in which one man was killed and one wounded practically ended the uprising. The times were ripening, however, and a change was soon to come.

The United States was making repeated offers to the Mexican Government to buy Texas, but this only made the Mexicans more determined to retain it at any cost. The Mexicans, resenting all attempts of the United States to possess the land, turned their attention to the Texans. Decrees were drawn up prohibiting slavery in Mexico, and forbidding further colonization. These decrees were specially aimed at Texas, and roused much bitterness and indignation. The march of events was hastened by the closing of all Texas ports, except Anahuac, and by the presence of military forces. An uprising occurred in June, 1832, which led to the removal of certain obnoxious officials. This was followed by the calling of a convention which elected Stephen F. Austin President. Petitions were drawn up asking the Mexican Government for free trade for three years, begging for a grant of land from the State to promote education, and asking for a separate government. Austin was sent with the petition to Mexico, but could not gain a hearing and was made a prisoner. During 1833 and 1834 the Mexican Government acceded to certain reforms; but in 1835 the spirit of revolt reappeared among the colonists. Then the Mexican Government made another attempt to collect duties at the Texas ports. An armed schooner was sent to Anahuac, but having committed various outrages, a Texas vessel captured it and the struggle against Mexico was precipitated. The first victory was that of Gonzales, October 2, 1835, when the Texans put the Mexicans to flight. On October 28th Colonel James Bowie and Captain J. W. Fannin defeated the Mexicans near Mission Concepción, a few miles below San Antonio; on December 11th that city was taken. A provisional government was formed, Henry Smith was elected Governor, and Sam Houston major-general of the Armies of Texas; Branch T. Archer, William H. Wharton, and Stephen F. Austin were appointed commissioners to the United States. Many Americans, principally from Mississippi, hurried to the assistance of the Texans. Dissension among the Texans, however, nearly proved disastrous. In March, 1836, two parties, one under Johnson and the other under Grant, were captured by the Mexicans, and the prisoners slaughtered; also Fannin's command, which had been in possession of the Goliad fortress, surrendered and was shamelessly massacred. In all, nearly five hundred Texans met death. In February-March occurred the heroic defense of the Alamo (q.v.). March 2d the Texans issued a declaration of independence, and as if to answer this, Santa Anna, the Mexican President, hurried his army in three columns eastward over the country. On April 21st the Texan army under Houston on the field of San Jacinto avenged the slaughter of Fannin's men and the Alamo. (See SAN JACINTO, BATTLE OF.) Santa Anna, a prisoner, was glad to sign a treaty in which he engaged to do what he could to secure recognition of the independence of Texas with boundaries not to extend beyond the Rio Grande.

Thus was launched the Republic of Texas. A constitution was ratified in September, 1836, and Houston was elected President. Houston was the capital from 1837 to 1839, when Austin became the capital. The great and pressing need of the Republic was money. With little taxable property, the Government ran deeply in debt. By 1841 the amount reached $7,500,000. To the financial difficulties of the Republic was added the aggravation of invasions from Mexico, which had never abandoned her claims on the country. Three times Mexican forces reached San Antonio, but the Mexicans always retreated without attempting to hold the place.

Meantime the independence of Texas had been recognized by the United States, France, Holland, Belgium, and Great Britain, and the presence of the representatives of these powers lent zest to the interest with which the subject of the annexation of Texas to the Union was invested. The question of annexation was bound up with that of slavery, and the whole Union was agitated. (See under UNITED STATES.) The matter became finally a national issue, and James K. Polk was elected President on a platform favoring annexation; but before he took office a joint resolution was passed by Congress making an offer of Statehood to Texas. This was accepted by the Texans, and in December, 1845, the State was formally admitted into the Union. The Mexican War (q.v.), originating in a dispute over the boundaries of Texas, followed, and the first fighting took place near the Rio Grande, at Palo Alto (May 8, 1846).

As a State of the Union Texas grew rapidly. Politics played small part until the wave of secession reached its borders. Texas, a slaveholding State, thereupon seceded from the Union (February 1, 1861). Sam Houston was Governor at the time, and threw all his weight in opposition to secession, but there was no staying the resolve of the people, many of whom went soon to join the armies of the Confederacy. The State was fortunate in that it was not the scene of much active fighting. Galveston was captured and held by the Federal forces for three months in the fall and winter of 1862; but two attempts of the Union forces to enter the State from Louisiana were disastrously defeated. The last battle of the war was fought on the Lower Rio Grande, near Palo Alto, a month after Appomattox.

Following out his plan of reconstruction, June 17, 1865, President Johnson appointed as provisional Governor A. J. Hamilton, a man conspicuous in antebellum Texas politics. A convention was called which adopted the Constitution in force in the State prior to secession, with amendments recognizing the abolition of slavery, renouncing the right of secession, conferring civil rights on freedmen, repudiating the State debt incurred during the war, and assuming the tax which had been laid by the United States Government on the State during the period of secession. The people ratified this Constitution and under it J. W. Throckmorton was elected Governor. The Reconstruction Acts of 1867 placed the State under the military authority, with General Sheridan in command. The carpetbaggers followed and the new reconstruction occupied the next three years. A constitution was submitted to the people in November, 1869, when Congressmen and State officers were elected, and on March 30, 1870, Texas was readmitted to the Union. At the election in November, 1872, the Democrats secured control of the State; and in December, 1873, a Democratic victory made Richard Coke Governor. By this time the State had become involved in debt to the extent of several millions of dollars on the score of reconstruction. The memory of reconstruction and the race problem have served to keep the State consistently Democratic.

GOVERNORS OF COAHUILA AND TEXAS

José Maria Viesca, First Constitutional Governor	1827-30
Rafael Eca y Musquiz	1830-31
José Maria de Letona	1831-32
Rafael Eca y Musquiz	1832-33
Juan M. de Veramendi	1833-34
Francisco V. y Villaseñor	1834-35
José Maria Cantú	1835
Marciel Borrego	1835
Augustin Viesca	1835

PROVISIONAL GOVERNOR BEFORE THE DECLARATION OF INDEPENDENCE

Henry Smith	November 12, 1835-March 18, 1836

PRESIDENTS UNDER THE REPUBLIC

David G. Burnet	March 18, 1836-October 22, 1836
Sam Houston	October 22, 1836-December, 1838
Mirabeau B. Lamar	December, 1838-December, 1840
David G. Burnet (acting)	December, 1840-December, 1841
Sam Houston	December, 1841-December, 1844
Anson Jones	December, 1844-February 19, 1846

GOVERNORS OF THE STATE

James P. Henderson	Democrat	1846-47
George T. Wood	"	1847-49
P. Hansborough Bell	"	1849-53
Elisha M. Pease	"	1853-57
Hardin G. Runnels	"	1857-59
Sam Houston	Independent and Unionist	1859-61
Edward Clark (acting)	Democrat	1861
Francis R. Lubbock	"	1861-63
Pendleton Murray	"	1863-65
Andrew J. Hamilton, Prov.	Unionist	1865-66
James W. Throckmorton	"	1866-67
Elisha M. Pease	Republican	1867-70
Edmund J. Davis	"	1870-74
Richard Coke	Democrat	1874-77
Richard B. Hubbard	"	1877-79
Oran M. Roberts	"	1879-83
John Ireland	"	1883-87
Lawrence S. Ross	"	1887-91
James S. Hogg	"	1891-95
Charles A. Culberson	"	1895-99
Joseph D. Sayers	"	1899-1903
S. W. Lanham	"	1903—

BIBLIOGRAPHY. Kennedy, *Texas, Geography, Natural History, and Topography* (New York, 1844); *Geological Surveys of Texas* (Austin, 1858 et seq.); Roberts, *Description of Texas* (Saint Louis, 1881); Spaight, *The Resources, Soil, and Climate of Texas* (Galveston, 1882); Hill, "Present Condition of the Knowledge of the Geology of Texas," in *United States Geological Survey Bulletin 45*, containing bibliography (Washington, 1887); Rhodes, *Birds of Southwestern Texas and Arizona* (Philadelphia, 1892); Raines, *Bibliography of Texas* (Austin, 1896). For history, consult: Yoakum, *History of Texas* (New York, 1856); Foote, *Texas and the Texans* (Philadelphia, 1841); Thrall, *History of Texas* (New York, 1856); Bancroft, *Mexican States and Texas* (San Francisco, 1885); Baker, *History of Texas* (New York, 1893); Wooten (editor), *Comprehensive History of Texas 1685-1897* (Dallas, 1898); Lubbock, *Six Decades in Texas* (Austin, 1900); Garrison, *Texas*, in "American Commonwealth Series" (Boston, 1903); *Texas State Historical Quarterly* (Austin, 1897 et seq.).

TEXAS, UNIVERSITY OF. A coeducational institution at Austin, Texas, with a medical department at Galveston, founded upon a grant of 1,000,000 acres of land by the Legislature in 1876. In 1883 an additional million acres was set apart and the university was opened. The medical building at Galveston was completed in 1890, when the department was opened and the John Sealey Hospital, presented the previous year, was occupied. The medical buildings were in great part rebuilt after the disastrous Galveston flood of 1900. Besides the medical department the university embraces the department of literature, sciences, and arts, offering the degrees of B.A., B.Lit., B.S., M.A., and M.S.; the department of engineering, conferring the degrees of civil engineer and engineer of mines; and the department of law, conferring the degrees of LL.B. and LL.M. New departments in electricity and mechanical engineering were established in 1903, when it was decided to give no degree for undergraduate work after 1906 except that of B.A. Two summer schools are conducted at Austin during June and July. In 1902 the student attendance was 1378, and the faculty numbered 109. The library had 40,000 volumes. The endowment was $1,363,000 and the income $275,303.

TEXAS FEVER (also known as Spanish splenic or acclimation fever, American cattle plague, red water, black water, yellow murrain, and bloody murrain). An epizoötic, reputed contagious or infectious fever of cattle, confined to regions south of the 37th parallel of north latitude, except when communicated by cattle brought from there. The cause is charged to *Pyrosoma bigeminum*, a protozoön found in the blood. Observations indicate that in the permanently infected districts cattle become accustomed to the influence of the protozoa, which pass through the organism without creating much disturbance, and generally without being noticed. It is claimed, however, that native cattle in more northern regions, not being protected by previous habitual exposure, are subject to injury. One of the first symptoms is an elevation of temperature, which ranges usually from 106° to 108° F., and sometimes as high as 110°. With this rise are symptoms of languor and fatigue, as drooping of the head, and lopped ears. In advanced cases the head droops so that the nose almost reaches the ground; the hind legs are placed close under the body; the legs are weak, and the animal frequently lies down, especially in water. The pulse is frequent, sometimes soft and feeble, but often hard and wiry. The inoculation of animals attacked with the blood of animals which have recovered is believed to be the only means of curing serious cases. But since the protozoön is spread from animal to animal by the cattle tick (*Boophilus bovis*), dips which rid the animals of the ticks have been suggested as preventive measures.

TEX'EL. The southernmost and largest of the West Frisian Islands, belonging to the Dutch Province of North Holland, and situated at the entrance to the Zuyder Zee (Map: Netherlands, C 1). It is separated from the mainland on the south by the Marsdiep, about 5 miles wide. Area, 67 square miles. It consists largely of good meadow land lined on the north and west by sand dunes, and protected from the sea on the other sides by dikes. The principal industry is sheep-raising, and wool and cheese of fine quality are exported. Population, in 1899, 5954.

TEXIER, tĕs'yā', CHARLES FÉLIX MARIE (1802-71). A French archæologist, born in Versailles. He explored the antiquities of Asia Minor and taught at the Collège de France. His works include: *Description de l'Asie Mineure*, published in Paris and London (1839-48); *Description de l'Arménie, la Perse et de la Mésopotamie* (1842-45); and *Asie Mineure* (1862).

TEXTILE DESIGNING (Lat. *textilis*, relating to weaving, from *textus*, fabric, composition, text, from *texere*, to weave; connected with Gk. *τέκτων*, *tektōn*, carpenter, *τέχνη*, *technē*, art, Skt. *takṣ*, to cut, form). That branch of textile manufacturing which is devoted to the construction of fabrics, their weaves and patterns or designs for the same. Unlike the designing for printed patterns, whether for textiles, wall-paper, or other purposes, which are termed 'applied designs'—and for which the designer is only called upon to use his skill in drawing and color combination—the designing of fabrics in which the pattern is to be woven of threads colored before weaving, or in which the pattern is produced by the weaves, necessitates in addition to knowledge of combining colors and drawing a thorough knowledge of each of the various departments or processes of textile manufacturing (q.v.). The designer must be able to construct fabrics of a required weight, texture, and finish, or for a specific purpose, telling the manufacturer what size of warp and filling to use, how many threads of each to the inch, and what weave will give the required results.

The construction of various weaves is one of the most important features of textile designing, and an account of weave construction will be found in the article WEAVING. A complete design for a woven fabric must contain at least the following specifications: Number of warp threads to an inch; number of inches wide on loom; number of picks, or filling threads, to an inch; size of warp and filling yarns and materials for same; the weave and the arrangement of the warp thread on the loom-harness, with full particulars relative to manipulation of materials in the process of manufacturing; the estimated weight of the fabric as woven; the finishing processes it is to be submitted to, together with its finished width, weight, and texture, that is, the count in warp and filling threads to the inch. When the pattern is to be worked out in colored threads the arrangement of these must be given; and when the pattern is drawn and possibly colored, then the weave is constructed in such a way as to produce with the woven threads the effect of the drawing as nearly as possible. See LOOM; WEAVING; TEXTILE MANUFACTURING.

TEXTILE MANUFACTURING. The industrial group of manufactures embracing the production from the various raw materials of fabrics of cotton, wool, silk, flax, hemp, and jute; hosiery and knit goods; felt goods and wool hats; cordage and twine; laces, braids, and embroideries.

TABLE I.—COMPARATIVE SUMMARY OF TEXTILE INDUSTRIES, NOT INCLUDING FLAX, HEMP, AND JUTE, 1880 TO 1900, WITH PER CENT. OF INCREASE FOR EACH DECADE

	Date of census			Per cent. of increase	
	1900	1890	1880	1890 to 1900	1880 to 1890
Number of establishments	4,171	4,114	4,018	1.4	2.4
Capital	$1,001,005,815	$739,973,661	$412,721,496	35.3	79.3
Salaried officials, clerks, etc., number	16,181	*10,179	†	59.0	......
Salaries	$22,331,972	*$11,930,750	†	87.2	......
Wage-earners, average number	640,548	501,718	‡384,251	27.7	30.6
Total wages	$202,690,706	$163,616,593	$105,050,666	23.9	55.8
Men, 16 years and over	288,871	216,345	159,382	33.5	35.7
Wages	$114,959,158	$91,038,323	†	26.3	......
Women, 16 years and over	283,638	243,589	169 806	16.4	43.5
Wages	$78,084,564	$66,644,785	†	17.2	......
Children, under 16 years	68,039	41,784	55,063	62.8	§24.1
Wages	$9,646,984	$5,933,485	†	62.6	......
Miscellaneous expenses	$60,444,630	$43,356,736	¶	39.4	......
Cost of materials used	$489,147,315	$421,398,196	$302 709,894	16.1	39.2
Value of products	$883,892,959	$721,949,262	$532,673,488	22.4	35.5

* Includes proprietors and firm members, with their salaries; number only reported in 1900, but not included in this table. † Not reported separately. ‡ Includes 2,115 officers and clerks whose salaries are not reported. § Decrease. ¶ Not reported.

TEXTILE MANUFACTURING IN THE UNITED STATES.—STATISTICS. The importance of the textile industry in the United States is seen from the accompanying table from the Twelfth Census, which shows 35.3 per cent. increase in the capital invested, during the last decade of the last century, over the decade immediately preceding: an increase of 23.9 per cent. in the annual amount of wages paid for the same period; but only 22.4 per cent. increase in the annual value of the manufactured product. This latter condition is explained by the decreased cost of production, due to the improved machinery and to a decreased cost of the several raw materials. An exact knowledge of the general growth of the industry is difficult to arrive at, in consequence of the above and other varying conditions, and probably the best idea of its growth is the increase of wage-earners as shown by decades in Table II. In spite of the fact that the improved machinery makes the productive power of one man's labor many times greater than it was a half century ago, the increase in wage-earners each decade has exceeded the general growth of the population except between 1850 and 1860.

TABLE II.—PER CENT. OF INCREASE IN AVERAGE NUMBER OF WAGE-EARNERS AND IN VALUE OF PRODUCTS: 1850 TO 1900*

PERIODS	Per cent. of increase in—	
	Average number of wage-earners	Value of products
1850 to 1900	336.1	586.4
1890 to 1900	27.7	22.4
1880 to 1890	30.6	35.5
1870 to 1880	39.8	2.4
1860 to 1870	41.7	142.3
1850 to 1860	32.1	66.8

* Not including flax, hemp, and jute.

The importance of the industry is also shown by Table III., giving the value of textile products by decades from 1810 to 1900:

TABLE III.—COMPARATIVE SUMMARY, VALUE OF PRODUCTS: 1810 TO 1900

DATE OF CENSUS	Total	Cotton manufacture *	Wool manufacture †	Silk manufacture	Hosiery and knit goods	Flax, hemp, and jute ‡	Dyeing and finishing textiles
1900	$931,494,556	$339,200,320	$296,990,484	$107,256,258	$95,482,566	$47,601,607	$44,963,331
1890	759,262,283	267,981,724	270,527,511	87,298,454	67,241,013	37,313,021	28,900,560
1880	532,673,488	192,090,110	238,085,686	41,093,045	29,167,227	....	32,297,420
1870	520,386,764	177,489,739	199,257,262	12,210,662	18,411,564	....	§113,017,537
1860	214,740,614	115,681,774	73,454,000	6,607,771	7,280,606	....	11,716,463
1850	128,769,971	61,869,184	48,608,779	1,809,476	1,028,102	....	15,454,430
1840	67,047,452	46,350,453	20,696,999	....	....	....	....
1830	37,062,981	22,534,815	14,528,166	....	....	....	....
1820	9,247,225	4,834,157	4,413,068	....	....	....	....
1810	51,685,785	¶26,076,997	‖25,608,788	....	....	....	....

* Includes cotton goods and cotton small wares. † Includes worsted goods; woolen goods; carpets and rugs, other than rag; felt goods, and wool hats. ‡ Includes cordage and twine; jute and jute goods; linen goods; and two establishments in 1890 classified as 'linen thread.' § At the census of 1870 the value of the fabric itself was reported, whereas in all subsequent censuses merely the value added to such fabric by the process of dyeing and finishing is given. ¶ Includes manufactures of cotton and flax in families and otherwise. ‖ Includes manufactures of wool in families and otherwise.

and in Table IV., which shows not only the 'combined textiles,' but each individual industry classed to show conditions each decade from 1850 to 1900.

The increase in the amount of the various raw materials used by decades from 1840 to 1900 is shown by Table V., which also furnishes a measure of the relative growth of the several industries. It is well to notice in this connection, however, that because of the unsettled conditions in the Southern States from 1860 to 1870 there was a decrease in the amount of cotton used, while for each decade there is a large and steady increase in the amount of wool used. During the twenty-year period 1860 to 1880 the amount of cotton used did not double itself, while the use of wool increased over 300 per cent.; but the use of cotton shows a wonderful increase from 1880 to 1900, due largely to the development of the cotton-manufacturing industry in the Southern States, which bids fair to monopolize the production of the medium and coarser grades of cotton fabrics.

TABLE V.—CONSUMPTION OF TEXTILE FIBRES: 1840 TO 1900

YEARS	Cotton, pounds*	Wool, pounds†	Silk, pounds
1900	1,910,509,193	412,323,430	9,760,770
1890	1,193,374,641	372,797,413	6,376,881
1880	798,344,838	296,192,229	2,690,482
1870	430,781,937	219,970,174	684,488
1860	443,845,378	98,379,785	462,965
1850	288,558,000	70,862,829	....
1840	126,000,000	....	....

* Includes cotton consumed in establishments classed as cotton goods, cotton small wares; woolen goods, worsted goods, carpet and rugs, other than rag; felt goods; wool hats; and hosiery and knit goods. † Includes wool consumed in establishments classed as woolen goods; worsted goods, carpets and rugs, other than rag; felt goods; wool hats; and hosiery and knit goods.

It is difficult to obtain exact information about the relative importance of the United States in the manufacture of textiles, as the statistics are collected in no other country with the thoroughness which characterizes the American census. The accompanying tables give in the most comprehensive way the opinions of the most capable statisticians. One might infer from Table VI. that in 1900 the United States led the world in the manufacture of cotton goods; yet it is universally known that Great Britain is far in the lead in cotton manufacturing; but because of the fact that the greater part

TABLE VI.—CONSUMPTION OF COTTON AT DECENNIAL PERIODS, 1830–1900

	Great Britain, number of thousand bales	Continent Europe, number of thousand bales	United States, number of thousand bales
Average for 5 years ending—			
1830	711	411	130
1840	1,156	629	255
1850	1,458	776	553
1860	2,265	1,490	813
1870	2,639	1,842	875
1880	2,924	2,455	1,543
Year 1890	4,140	4,277	*2,983
Year 1900	4,079	5,720	4,599

* Census figures, reduced to bales of 400 pounds. Cotton used in wool manufactures included.

TABLE IV.—COMPARATIVE SUMMARY, BY INDUSTRIES: 1850 TO 1900

INDUSTRIES	Year	Number of establishments	Capital	Salaried officials, clerks, etc.		Wage-earners		Miscellaneous expenses	Cost of materials used	Value of products
				Number	Salaries	Average number	Total wages			
Cotton manufacture—Cotton goods	1900	973	$460,842,772	4,718	$7,123,574	297,929	$85,126,310	$21,650,144	$173,441,390	$332,806,156
Cotton small wares	1900	82	6,397,385	189	226,625	4,932	1,563,442	462,534	3,110,137	6,394,164
Wool manufacture	1900	1,414	310,179,749	4,495	6,455,495	159,108	57,933,817	17,329,932	181,159,127	296,990,484
Silk manufacture	1900	483	81,082,201	2,657	3,134,352	65,416	20,982,194	10,264,208	62,406,665	107,256,258
Hosiery and knit goods	1900	921	81,860,604	2,809	3,124,798	83,387	24,358,627	6,599,865	51,071,859	95,482,566
Flax, hemp, and jute	1900	141	41,991,762	641	957,190	20,903	6,331,741	2,678,286	32,197,885	47,601,607
Dyeing and finishing textiles	1900	298	60,643,104	1,318	2,267,128	29,776	12,726,316	4,137,947	17,958,137	44,963,331
Combined textiles	1900	4,312	$1,042,997,577	16,822	$23,289,162	661,451	$209,022,447	$63,122,916	$521,345,200	$931,494,566
Cotton manufacture	1890	905	$354,020,843	2,709	$3,464,734	218,876	$66,024,538	$16,716,524	$154,912,979	$267,981,724
Wool manufacture	1890	1,693	245,886,743	3,652	4,657,695	154,271	54,339,775	15,622,263	167,233,987	270,527,511
Silk manufacture	1890	472	51,007,537	1,531	1,917,877	49,382	17,762,441	4,259,623	51,004,425	87,298,454
Hosiery and knit goods	1890	796	50,607,738	1,621	1,685,153	59,588	16,578,119	3,627,245	35,861,585	67,241,013
Flax, hemp, and jute	1890	162	27,731,649	458	609,170	15,519	4,872,389	1,431,932	26,148,344	37,313,021
Dyeing and finishing textiles	1890	248	38,450,800	666	805,291	19,601	8,911,720	3,131,081	12,385,220	28,900,560
Combined textiles	1890	4,276	$767,705,310	10,637	$12,539,920	517,237	$168,488,982	$44,788,668	$447,546,540	$759,262,283
Cotton manufacture*	1880	756	$208,280,346	....	....	†174,659	$42,040,510	....	$102,206,347	$192,090,110
Wool manufacture	1880	2,330	143,512,278	....	....	132,672	40,687,612	....	149,160,600	238,085,686
Silk manufacture	1880	382	19,125,300	....	....	31,337	9,146,705	....	22,467,701	41,033,045
Hosiery and knit goods	1880	359	15,579,591	....	....	28,885	6,701,475	....	15,210,951	29,167,227
Dyeing and finishing textiles	1880	191	26,223,981	....	....	16,698	6,474,364	....	13,664,295	32,297,420
Combined textiles	1880	4,018	$412,721,496	....	....	†384,251	$105,050,666	....	$302,709,894	$532,673,488
Cotton manufacture	1870	956	$140,706,291	....	....	135,369	$39,044,132	....	$111,736,936	$177,489,739
Wool manufacture	1870	3,208	121,451,059	....	....	105,071	35,928,150	....	124,318,792	199,257,262
Silk manufacture	1870	86	6,231,130	....	....	6,649	1,942,286	....	7,817,559	12,210,662
Hosiery and knit goods	1870	248	10,931,260	....	....	14,788	4,429,085	....	9,835,823	18,411,564
Dyeing and finishing textiles	1870	292	18,374,503	....	....	13,066	5,221,538	....	99,539,992	‡113,017,537
Combined textiles	1870	4,790	$297,694,243	....	....	274,943	$86,565,191	....	$353,249,102	$520,386,764
Cotton manufacture	1860	1,091	$98,585,269	....	....	122,028	$23,940,108	....	$57,285,534	$115,681,774
Wool manufacture	1860	1,476	38,814,422	....	....	50,419	11,699,630	....	43,447,048	73,454,000
Silk manufacture	1860	139	2,926,980	....	....	5,435	1,050,224	....	3,901,777	6,607,771
Hosiery and knit goods	1860	197	4,035,510	....	....	9,103	1,661,972	....	3,202,317	7,280,606
Dyeing and finishing textiles	1860	124	5,718,671	....	....	7,097	2,001,528	....	5,006,435	11,716,463
Combined textiles	1860	3,027	$150,080,852	....	....	194,082	$40,353,462	....	$112,842,111	$214,740,614
Cotton manufacture	1850	1,094	$74,500,931	....	....	92,286	....	....	$34,835,056	$61,869,184
Wool manufacture	1850	1,675	31,971,631	....	....	45,438	....	....	28,831,583	48,608,779
Silk manufacture	1850	67	678,300	....	....	1,743	....	....	1,093,860	1,809,476
Hosiery and knit goods	1850	85	544,735	....	....	2,325	....	....	415,113	1,028,102
Dyeing and finishing textiles	1850	104	4,818,350	....	....	5,105	....	....	11,540,347	15,454,430
Combined textiles	1850	3,025	$112,513,947	....	....	146,897	....	....	$76,715,959	$128,769,971

*In addition to these data there were in the census of 1880 returns for 249 'special mills,' engaged in working raw cotton, waste, or cotton yarn into hosiery, webbing, tapes, and fancy fabrics, and mixed goods or other fabrics, which are not sold as specific manufactures of wool or cotton. These 249 establishments reported $11,224,448 capital, 12,928 employees, $3,573,909 wages, $2,338,385 cost of cotton consumed, $18,860,273 value of products, and should be considered in making comparisons. In 1890 this class of mills is reported under a number of different heads, although some of them may be included in the totals for textile industries presented in the figures for 1890. † Includes 2,115 officers and clerks, whose salaries were not reported. ‡ At the census of 1870 the value of the fabric itself was reported, whereas in all subsequent censuses merely the value added to such fabric by the process of dyeing and finishing is given.

annual value of the manufactured product. This latter condition is explained by the decreased cost of production, due to the improved machinery and to a decreased cost of the several raw materials. An exact knowledge of the general growth of the industry is difficult to arrive at, in consequence of the above and other varying conditions, and probably the best idea of its growth is the increase of wage-earners as shown by decades in Table II. In spite of the fact that the improved machinery makes the productive power of one man's labor many times greater than it was a half century ago, the increase in wage-earners each decade has exceeded the general growth of the population except between 1850 and 1860.

TABLE II.—PER CENT. OF INCREASE IN AVERAGE NUMBER OF WAGE-EARNERS AND IN VALUE OF PRODUCTS: 1850 TO 1900 *

PERIODS	Per cent. of increase in—	
	Average number of wage-earners	Value of products
1850 to 1900	336.1	586.4
1890 to 1900	27.7	22.4
1880 to 1890	30.6	35.5
1870 to 1880	39.8	2.4
1860 to 1870	41.7	142.3
1850 to 1860	32.1	66.8

* Not including flax, hemp, and jute.

The importance of the industry is also shown by Table III., giving the value of textile products by decades from 1810 to 1900:

TABLE III.—COMPARATIVE SUMMARY, VALUE OF PRODUCTS: 1810 TO 1900

DATE OF CENSUS	Total	Cotton manufacture *	Wool manufacture †	Silk manufacture	Hosiery and knit goods	Flax, hemp, and jute ‡	Dyeing and finishing textiles
1900	$931,494,556	$339,200,320	$296,990,484	$107,256,258	$95,482,566	$47,601,607	$44,963,331
1890	759,262,283	267,981,724	270,527,511	87,298,454	67,241,013	37,313,021	28,900,560
1880	532,673,488	192,090,110	238,085,686	41,093,045	29,167,227	....	32,297,420
1870	520,386,764	177,489,739	199,257,262	12,210,662	18,411,564	....	§113,017,537
1860	214,740,614	115,681,774	73,454,000	6,607,771	7,280,606	....	11,716,463
1850	128,769,971	61,869,184	48,608,779	1,809,476	1,028,102	....	15,454,430
1840	67,047,452	46,350,453	20,696,999	....	....	....	....
1830	37,062,981	22,534,815	14,528,166	....	....	....	....
1820	9,247,225	4,834,157	4,413,068	....	....	....	....
1810	51,685,785	¶26,076,997	‖25,608,788	....	....	....	....

* Includes cotton goods and cotton small wares. † Includes worsted goods; woolen goods; carpets and rugs, other than rag; felt goods, and wool hats. ‡ Includes cordage and twine; jute and jute goods; linen goods; and two establishments in 1890 classified as 'linen thread.' § At the census of 1870 the value of the fabric itself was reported, whereas in all subsequent censuses merely the value added to such fabric by the process of dyeing and finishing is given. ¶ Includes manufactures of cotton and flax in families and otherwise. ‖ Includes manufactures of wool in families and otherwise.

and in Table IV., which shows not only the 'combined textiles,' but each individual industry classed to show conditions each decade from 1850 to 1900.

The increase in the amount of the various raw materials used by decades from 1840 to 1900 is shown by Table V., which also furnishes a measure of the relative growth of the several industries. It is well to notice in this connection, however, that because of the unsettled conditions in the Southern States from 1860 to 1870 there was a decrease in the amount of cotton used, while for each decade there is a large and steady increase in the amount of wool used. During the twenty-year period 1860 to 1880 the amount of cotton used did not double itself, while the use of wool increased over 300 per cent.; but the use of cotton shows a wonderful increase from 1880 to 1900, due largely to the development of the cotton-manufacturing industry in the Southern States, which bids fair to monopolize the production of the medium and coarser grades of cotton fabrics.

TABLE V.—CONSUMPTION OF TEXTILE FIBRES: 1840 TO 1900

YEARS	Cotton, pounds *	Wool, pounds †	Silk, pounds
1900	1,910,509,193	412,323,430	9,760,770
1890	1,193,374,641	372,797,413	6,376,881
1880	798,344,838	296,192,229	2,690,482
1870	430,781,937	219,970,174	684,488
1860	443,845,378	98,379,785	462,965
1850	288,558,000	70,862,829	....
1840	126,000,000	....	....

* Includes cotton consumed in establishments classed as cotton goods, cotton small wares; woolen goods, worsted goods, carpet and rugs, other than rag; felt goods; wool hats; and hosiery and knit goods. † Includes wool consumed in establishments classed as woolen goods; worsted goods, carpets and rugs, other than rag; felt goods; wool hats; and hosiery and knit goods.

It is difficult to obtain exact information about the relative importance of the United States in the manufacture of textiles, as the statistics are collected in no other country with the thoroughness which characterizes the American census. The accompanying tables give in the most comprehensive way the opinions of the most capable statisticians. One might infer from Table VI. that in 1900 the United States led the world in the manufacture of cotton goods; yet it is universally known that Great Britain is far in the lead in cotton manufacturing; but because of the fact that the greater part

TABLE VI.—CONSUMPTION OF COTTON AT DECENNIAL PERIODS, 1830–1900

	Great Britain, number of thousand bales	Continent Europe, number of thousand bales	United States, number of thousand bales
Average for 5 years ending—			
1830	711	411	130
1840	1,156	629	255
1850	1,458	776	553
1860	2,265	1,490	[illegible]
1870	2,639	1,842	[illegible]
1880	2,924	2,455	[illegible]
Year 1890	4,140	4,277	*[illegible]
Year 1900	4,079	5,720	[illegible]

* Census figures, reduced to bales of 400 [illegible] used in wool manufactures included.

TABLE IV.—COMPARATIVE SUMMARY, BY INDUSTRIES: 1850 TO 1900

INDUSTRIES	Year	Number of establishments	Capital	Salaried officials, clerks, etc.		Wage-earners		Miscellaneous expenses	Cost of materials used	Value of products
				Number	Salaries	Average number	Total wages			
manufacture—Cotton goods	1900	973	$460,842,772	4,713	$7,123,574	297,929	$85,126,310	$21,650,144	$173,441,390	$332,806,156
Cotton small wares	1900	82	6,397,385	189	226,625	4,932	1,563,442	462,534	3,110,137	6,394,164
manufacture	1900	1,414	310,179,749	4,495	6,455,495	159,108	57,933,817	17,329,932	181,159,127	296,990,484
ufacture	1900	483	81,082,201	2,657	3,134,352	65,416	20,982,194	10,264,208	62,406,665	107,256,258
and knit goods	1900	921	81,860,604	2,809	3,124,798	83,387	24,358,627	6,599,865	51,071,859	95,482,566
p, and jute	1900	141	41,991,762	641	957,190	20,903	6,331,741	2,678,286	32,197,885	47,601,607
d finishing textiles	1900	298	60,643,104	1,318	2,267,128	29,776	12,726,316	4,137,947	17,958,137	44,963,331
ned textiles	1900	4,312	$1,042,997,577	16,822	$23,289,162	661,451	$209,022,447	$63,122,916	$521,345,200	$931,494,566
manufacture	1890	905	$354,020,843	2,709	$3,464,734	218,876	$66,024,538	$16,716,524	$154,912,979	$267,981,724
ufacture	1890	1,693	245,886,743	3,652	4,057,695	154,271	54,339,775	15,622,263	167,233,987	270,527,511
facture	1890	472	51,007,537	1,531	1,917,877	49,382	17,762,441	4,259,623	51,004,425	87,298,454
d knit goods	1890	796	50,607,738	1,621	1,685,153	59,588	16,578,119	3,627,245	35,861,585	67,241,013
and jute	1890	162	27,731,649	458	609,170	15,519	4,872,389	1,431,932	26,148,344	37,313,021
nishing textiles	1890	248	38,450,800	666	805,291	19,601	8,911,720	3,131,081	12,385,220	28,900,560
textiles	1890	4,276	$767,705,310	10,637	$12,539,920	517,237	$168,488,982	$44,788,668	$447,546,540	$759,262,283
facture*	1880	756	$208,280,346	....	....	†174,659	$42,040,510	....	$102,206,347	$192,090,110
facture	1880	2,330	143,512,278	....	....	132,672	40,687,612	....	149,160,600	238,085,686
anufacture	1880	382	19,125,300	....	....	31,337	9,146,705	....	22,467,701	41,033,045
y and knit goods	1880	359	15,579,591	....	....	28,885	6,701,475	....	15,210,951	29,167,227
and finishing textiles	1880	191	26,223,981	....	....	16,698	6,474,364	....	13,664,295	32,297,420
bined textiles	1880	4,018	$412,721,496	....	....	†384,251	$105,050,666	....	$302,709,894	$532,673,488
manufacture	1870	956	$140,706,291	....	....	135,369	$39,044,132	....	$111,736,936	$177,489,739
manufacture	1870	3,208	121,451,059	....	....	105,071	35,928,150	....	124,318,792	199,257,262
Silk manufacture	1870	86	6,231,130	....	....	6,649	1,942,286	....	7,817,559	12,210,662
Hosiery and knit goods	1870	248	10,931,260	....	....	14,788	4,429,085	....	9,835,823	18,411,564
Dyeing and finishing textiles	1870	292	18,374,503	....	....	13,066	5,221,538	....	99,539,992	‡113,017,537
Combined textiles	1870	4,790	$297,694,243	....	....	274,943	$86,565,191	....	$353,249,102	$520,386,764
Cotton manufacture	1860	1,091	$98,585,269	....	....	122,028	$23,940,108	....	$57,285,534	$115,681,774
Wool manufacture	1860	1,476	38,814,422	....	....	50,419	11,699,630	....	43,447,048	73,454,000
Silk manufacture	1860	139	2,926,980	....	....	5,435	1,050,224	....	3,901,777	6,607,771
Hosiery and knit goods	1860	197	4,035,510	....	....	9,103	1,661,972	....	3,202,317	7,280,606
Dyeing and finishing textiles	1860	124	5,718,671	....	....	7,097	2,001,528	....	5,005,435	11,716,463
Combined textiles	1860	3,027	$150,080,852	....	....	194,082	$40,353,462	....	$112,842,111	$214,740,614
Cotton manufacture	1850	1,094	$74,500,931	....	....	92,286	....	....	$34,835,056	$61,869,184
Wool manufacture	1850	1,675	31,971,631	....	....	45,438	....	....	28,831,583	48,608,779
Silk manufacture	1850	67	678,300	....	....	1,743	....	....	1,093,860	1,809,476
Hosiery and knit goods	1850	85	544,735	....	....	2,325	....	....	415,113	1,028,102
Dyeing and finishing textiles	1850	104	4,818,350	....	....	5,105	....	....	11,540,347	15,454,430
Combined textiles	1850	3,025	$112,513,947	....	....	146,897	....	....	$76,715,959	$128,769,971

---

*In addition to these data there were in the census of 1880 returns for 249 'special mills,' engaged in working raw cotton, waste, or cotton yarn into hosiery, webbing, tapes, and fancy fabrics, and mixed goods or other fabrics, which are not sold as specific manufactures of wool or cotton. These 249 establishments reported $11,224,448 capital, 12,928 employees, $3,573,909 wages, $2,338,385 cost of cotton consumed, $18,860,273 value of products, and should be considered in making comparisons. In 1890 this class of mills is reported under a number of different heads, although some of them may be included in the totals for textile industries presented in the figures for 1890. † Includes 2,115 officers and clerks, whose salaries were not reported. ‡ At the census of 1870 the value of the fabric itself was reported, whereas in all subsequent censuses merely the value added to such fabric by the process of dyeing and finishing is given.

of the spindles in the United States run on coarse or medium-sized yarns, and those of England on much finer yarns, the United States actually spins more pounds of the raw material.

TABLE VII.—COTTON SPINDLES IN THE WORLD AT VARIOUS PERIODS, IN THOUSANDS

	1900	1897	1887	1877	1861
Great Britain.....	46,000	44,900	43,000	39,500	30,300
Continent of Europe..................	33,000	30,350	23,750	19,600	10,000
United States.....	19,008	16,800	13,500	10,000	6,000
India..................	4,400	4,000	2,400	1,230	338
Japan..................	1,500	970	....	....	....
China..................	600	440	....	....	....
Canada..............	640	560	....	....	....
Mexico..............	460	450	....	....	....

None of the European countries equals the United States in spindles, so that the latter is second only to Great Britain.

The relative standing of the countries in wool manufacturing is more difficult to arrive at accurately; but the following table, compiled from a trade circular of Messrs. Helmuth, Schwartz & Co., London, who are recognized as authority on the production and consumption of wool throughout the world, and from figures made up by the National Association of Wool Manufacturers (*Bulletin* for November, 1900)—the nearest year of comparison being 1894—shows the net pounds available for home consumption in the several countries. It might be said that Great Britain, France, Germany, and Austria-Hungary produce fully five-sixths of all the woolen goods made in Europe, Great Britain being in the lead.

TABLE VIII.

COUNTRIES	Pounds
Great Britain..	507,000,000
North America..	458,000,000
France..	457,610,000
Austria-Hungary..	386,800,000
Germany..	383,090,000

The statistical position of the several countries engaged in silk manufacturing is readily seen in Table IX., which gives the value of silk products in Europe and in the United States, showing that while France was first, the United States was a good second in 1900; but when we consider that the industry in this country has been developed since 1870 and note, as in Tables III. and IV., the rapid growth, we may believe that if it already does not it will soon lead in the manufacture of silks.

TABLE IX.—VALUE OF SILK PRODUCTS OF EUROPE AND THE UNITED STATES: 1900*

COUNTRIES	Value of products	Per cent. of products
France..................................	$122,000,000	30.9
United States..................................	92,000,000	23.3
Germany..................................	73,000,000	18.5
Switzerland..................................	38,000,000	9.6
Russia (in Europe)..................................	21,000,000	5.3
Austria-Hungary..................................	17,000,000	4.3
Great Britain..................................	15,000,000	3.8
Italy..................................	13,000,000	3.3
Spain and Portugal..................................	4,000,000	1.0
Total..................................	$395,000,000	100.0

INFLUENCES CONTROLLING DEVELOPMENT. The influences controlling the establishment of the textile industry in a given country are primarily the supply of the raw material and the adaptability of the people to a manufacturing life. Among the earliest forms of machinery are the hand-loom and spinning-wheel; and as sheep may be, and usually are, raised in any country where clothing must be warm, it is not surprising to find in the world's earliest history records of the production of fabrics of *wool;* these came to be known as *homespun*, because made from yarn spun at home and woven by hand by some member of the household. That the woolen industry should spring up in primitive communities, and among people too poor to purchase material for clothing, is only natural; and as the comforts of life became more accessible and labor became diversified and specialized, owing to the increase in population, the tendency was to produce fabrics for sale and in such quantities as required the use of more improved machinery; and in order to further reduce the cost large numbers of machines were collected and there resulted the mill or factory. That the woolen industry has secured a foothold in all countries in which wool fabrics are needed for clothing, with the exception of the polar regions, is, then, not surprising.

Cotton being a sub-tropical plant and the lint being separable with ease from the seed by hand, and as the fibre can be spun and woven in as simple a way as wool was manufactured in primitive communities, it would seem that the cotton industry should have developed near the source of the raw material; but the sections of the different countries suited to raising cotton were largely inhabited by people with agricultural instincts, consequently the industry has developed in more thickly settled communities and in sections remote from the cotton field. One important feature in the early development of the cotton industry in factories was the fact that fabrics of cotton must necessarily be light in weight and of comparatively fine yarns, consequently the proportion of labor cost to the cost of production was much greater than in the production of fabrics of wool, and the tendency was to concentrate in their production; this condition also stimulated the invention of labor-saving machinery. The result is that virtually the whole manufacture is in the hands of invested capital, and the tendency is for it to expand in communities where it is already established, and, unless favored by special advantages, to languish or to be neglected in sections where it is newly introduced.

In the thickly settled centres of India the industry had its greatest growth in a semi-tropical country and in a country fully adapted to the production of the fibre, yet, strange as it may seem, the inhabitants make better laborers in the factories than they do cultivators of the crop. Those who do follow agricultural pursuits are content to do so in a small way, simply raising the product for individual use rather than farming in a commercial way. This condition was recently referred to by Sir George Watt, reporter to the Government of India on Economic Products, as follows: "Like many other countries in the East and Far East, India cannot be treated geographically, for in every instance the people on the soil must be taken into consideration. In places like, say Africa, districts may be found where the planter can settle on virgin soil and find natives who are only too willing to work for wages; but in India a more civilized, we might say more dignified, set of people are to be found, and these natives prefer to manage the soil without European intervention. This feeling is illustrated in a higher stage of the industry, where the best and largest cotton mills are owned by natives or are operated by native companies."

---

* International Universal Exposition at Paris: Report of United States Commissioner Peck; Report on silk fabrics, contributed by Franklin Allen, Jr., of the United States, in the silk section (Class 83). Government Printing Office, Washington, D. C., 1901, page 565.

In China, Japan, the East Indies, and Mexico there has been of recent years a considerable introduction or development of the industry, due almost entirely to the adaptability of the people to a manufacturing life. Yet it is doubtful if the movement would have been as successful in some of these cases if there had not been encouragement in the way of Government measures.

The most wonderful growth of the cotton-manufacturing industry has been in the Southern United States. The availability of the raw material, made possible largely by the agricultural labor of the negro, and the presence of a class of the white population who, after the war, found themselves without homes or occupation and who it was found were teachable and tractable, and would make good factory hands, and were to be had in abundance, were the chief factors in this development; then there were available water-power and land which could be secured cheaper than elsewhere, and at first municipal aid in the way of exemption from taxation for a term of years. The growth of the industry in the Southern States has been remarkably steady since 1880, and ample proof of its success is evidenced by the fact that more and larger mills are now being built, together with the enlargement and development of older ones.

The sources which first gave the so-called 'civilized' nations their fine and beautiful fabrics of silk were China and Japan; there the silkworm flourished, labor was plentiful and cheap, and the nations æsthetic; they produced beautiful but costly fabrics which were considered luxuries as far back as the nations have a history, yet these nations now produce less in value than many others, though they still produce fabrics which the more highly civilized nations can hardly equal. It is natural to expect that the growth of the silk industry should be greatest in those countries which can produce the raw material, but this is not always the case. The introduction of the silkworm into Central and Western Europe caused a remarkable expansion of the manufacture of silks in Switzerland, Italy, Austria, and France. The Germans, producing practically no raw silk, however, have made a great success of the industry, as has the United States in recent years. England, however, with a wonderful capacity for manufacturing, having attempted the silk industry, relying on imported silk, though fairly successful for a time, has seen it decline for the last half-century, while the cotton industry during the same period has had an extraordinary development. Mr. Edward Stanwood, of Boston, a textile statistician, in speaking of the development of the industry of the United States, says: "Reasons corresponding to those which caused the wool manufacture to spring up in every part of the country and which concentrated the manufacture of cotton where power is cheap, where rates of transportation are low, where labor is abundant, or in the immediate vicinity of a supply of cotton, result in a still greater localization of the silk industry. Eleven-twelfths of all the establishments in the country are in the five adjoining States of Pennsylvania, New Jersey, New York, Connecticut, and Massachusetts, and of the spindles, more than nineteen-twentieths of the whole are in the mills of those States." The most important reason for this localization is the presence of sufficient labor of requisite skill to manufacture the raw material and produce fine and costly fabrics—a labor which would be too costly to employ in the production of cotton goods except those of the very finest quality, but which may be employed in the silk industry with profit. Yet another factor has been an encouraging Government policy, which has helped to establish the industry more firmly.

These are briefly the important features in connection with the development of the most important of the world's textile industries. See COTTON; SILK; WOOL AND WORSTED MANUFACTURES; FACTORIES AND FACTORY SYSTEM; MANUFACTURES; etc., etc.

TEXTILE PRINTING. The art of producing figured designs upon textile fabrics, by dyeing or staining, can be traced back 4000 years to the early homes of textile weaving, in India and Egypt. Probably the earliest figured effects were produced by securely binding up spots all over the material so that the dye into which the fabric was afterwards dipped could not penetrate these places. Another method of producing white or uncolored spots was by applying fused wax, which, of course, was removed after the cloth had been dyed. According to Pliny, the Egyptians, from early times, were very skillful in the production of patterned cloth by applying or painting mordants on fabrics and then dyeing them. Another way of producing the same effect was the use of the stencil, on which the coloring material was applied with a brush. Painting, or making the designs directly with a brush, was a common method of producing figured textiles; most of the early figured textiles introduced into Europe were not really printed, but only painted fabrics. It is recorded that painted cloth, probably linen, was produced in London in 1410.

The printing block, in its most primitive form, was used in the Orient from the remotest times. In Europe it seems to have been applied to the printing of fabrics before its use in book-printing was thought of. For centuries it was the only means used for producing figured designs not embroidered or painted, and it is still employed for producing special patterns. Upon the face of a block of some hard wood, 9 or 10 inches long, 5 or 6 inches wide, and half as thick, the design was carved, a stout handle having previously been fastened to the block. Sometimes stout copper wire was bent into the required shape and hammered into the block along the outlines of the pattern, which had been previously traced on the wood. The table upon which the printing was performed was a smooth flag of sandstone, covered with securely fastened blanketing. Over this table the fabric was spread. The thickened color was spread on a woolen cloth, upon which the printer applied the block and then stamped it upon the cloth. It required great skill and experience on the part of the printer to dip up the color evenly and in the right amount upon the block and then to apply it over and over, in exactly the proper place upon the fabric, until the entire surface had been covered with the design. Of course a separate block, with the proper portion of the design thereon, was required for each color, and between the applications of two successive colors the cloth was thoroughly dried. The *Perrotine* (so called from the name of its inventor) is a device for producing block printing by machinery. The design is engraved in relief upon cast metal plates. It is now but little used.

The invention of the roller printing press marked an epoch in the history of textile printing. It made possible the production of patterns complicated in design and coloring, at a cost so slight as to make it practicable to use them for the most inexpensive fabrics. The first patents for roller printing were taken out in England in 1743 and 1772, and in France in 1801. The invention is usually ascribed to Thomas Bell. The roller printing press consists of a huge cylinder or bowl, revolving on its axis and carrying the cloth to be printed. While passing over this drum the material to be printed is brought into contact with another cylinder which carries the color and upon whose surface the pattern is engraved. The drum is covered or cushioned with several layers of a coarse cloth called lapping. Against this bowl is pressed the engraved copper cylinder, which receives the color from a wooden cylinder, covered with cloth and dipping into the color-trough. In order to remove the surplus color from the copper roller, the so-called *doctor* is applied; this is simply a sharp blade which is pressed at an angle on the roller and scrapes the surplus color from it. In order to remove any loose threads or filaments, there is also a *lint-doctor*. The cloth to be printed passes between the engraved copper roller and the bowl, and in order to have an elastic underlayer it is supplied with a *blanket*, which is usually of wool. To keep the blanket clean the *back-cloth*, of unbleached cotton, is allowed to intervene between blanket and printing cloth. The three cloths (blanket, back-cloth, and cloth to be printed) go through at the same time between the bowl and the printing roller. The latter gives the color kept in the engraving over to the printing cloth next to it. This giving up is caused (1) by the pressure of the printing roller against the drum, and (2) by the action of the lapping and blanket, which, by forming a kind of elastic cushion, press the cloth into the engraved cavities of the roller and force the cloth to absorb the color, which is prevented from spreading by the pressure exerted at the same time. The copper roller is a hollow cylinder mounted on an iron mandrel. It is sometimes engraved by hand, but more often by machine. The engraving is accomplished mechanically by producing the design in a small section by hand, then reproducing it on a second piece of hardened steel, from which it is easily stamped over and over on the comparatively soft copper. By another method, known as the chemical process, the copper roller is covered with varnish through which the pattern is cut with a pantograph (q.v.). The roller is then immersed in acid, which eats out the exposed copper in the form of the design, after which the varnish is removed from the roller. The printed fabric is dried by passing it slowly over and near a series of steam-heated hollow cast-iron plates. As each roller prints but one color, there are as many rollers in a cylinder printing press as the desired number of colors. Great care has to be observed to keep the colors clear. In order that a dark shade may not soil a light one, the lighter shades are usually printed first and sometimes a plain starch roller is applied between the two.

Before it is printed the cloth is subjected to various preliminary processes, depending upon the nature of the fabric. Cotton goods are bleached and padded or treated to dressing to give them the proper body and surface. They are then run through the *lint-doctor* to remove all hairy projections. Woolen goods must be treated to a preliminary bath in a weak solution of sodium hypochlorite. The cloth is moistened before printing, and after printing is washed and dried. Silk has to be prepared for printing by suitable agents, such as tin with or without an acid. Both wool and silk require to be entirely freed from grease before they can be printed.

The preparation of the colors for printing requires great skill and knowledge of the properties of the different dyestuffs. The colors are mixed in copper pans so mounted that their contents can be boiled by steam, cooled with water, and easily emptied. Wooden paddles are provided for stirring the colors, or the agitation may be performed by mechanical appliances. As most of the colors are thickened with starch or flour, so that they will spread well, they require straining through a copper wire sieve.

The printing of cotton fabrics is a much more complicated and difficult process than that of printing silk or wool, because many of the complex methods that may be applied to the former are, from the nature of the material, inapplicable to the latter. The many different methods and combinations of methods by which the color effects are produced on cotton fabrics have been variously classified by writers on textile printing. To understand the production of these different so-called 'styles' involves a knowledge of the principles and chemistry of dyeing. (See DYEING.) The simplest classification is that adopted by Georgievic, in his work named in the bibliography. According to his classification, the production of a pattern upon cotton cloth may be accomplished as follows: (1) Direct printing; (2) combined dyeing and printing; (3) discharge style printing; (4) reserve style printing. *Direct printing* is done by mixing the desired color with the proper fixing agents and applying the mixture directly to the fabric. In *combined dyeing and printing*, the printing is done with mordants, and then the whole fabric is dyed. In the *discharge style* the effect is produced either by using a solution that will discharge the mordant or the dye itself. In the *reserve style* various substances, printed on the fabric, are employed to prevent absorption or development of other colors subsequently applied by padding or dyeing. The last three groups belong to the general class of dyes, as opposed to simple printed colors.

Considering these four groups more carefully, we find that in direct printing three general methods are used for fixing the color upon the fabric, the method used in a given case depending upon the chemical nature of the dyestuff. These methods are: (1) *Steaming*, in which printing is followed by air drying and steaming, or by immediate steaming, drying, and again steaming; (2) *oxidizing*, in which the color is fixed by the process known as 'aging,' either by prolonged exposure to the air or by passing through a steam 'ager;' (3) *reducing*, a method applied to indigo printing. Indigo is printed upon fabrics in two ways known as the 'glucose' and 'reduced indigo' processes which are briefly described by Sadtler (see bibliography) as follows: By the first method "Indigo is finely ground and made into a paste with water, to which is added caustic soda; this is now kept in a closed vessel in order to prevent as much as possible the absorption of carbonic acid from the atmosphere. The proportioning of the ingredients depends on the desired shade of blue. When used in printing it is thickened with dextrin and starch. . . . The cloth, before being printed upon, is worked through a twenty-five per cent. solution of glucose and dried. After printing, the cloth must be again dried and passed through an atmosphere of wet steam, to effect the *reduction* of the indigo which now takes place. The cloth is now washed in water, being repeatedly, during the washing, exposed to the air, when the *reduced* indigo is oxidized and its real color appears. . . . The second process is based upon the fact that indigo, when finely ground and mixed with lime and thiosulphate of soda in suitable thickening agents, is reduced; if with this reduced indigo paste, patterns are printed upon cotton fabrics, and then exposed to the air, the indigo is oxidized with a regeneration of the blue color. The pieces are then washed and dried. Instead of using indigo in printing, one of the newer colors, *immedial blue*, is now very extensively used and printed with suitable mordants directly upon the goods."

Passing on to the second general method of textile printing, which is a combination of printing and dyeing, four operations are involved. First, the fabric is printed with the appropriate mordant; then follows the *aging* process, during which the printed mordant is decomposed and more firmly fixed to the cloth; then follows an operation known as *dunging*, which removes the thickening, no longer needed in the mordant; and finally *dyeing*, the dye, of course, remaining fixed only to that part of the fabric which was previously treated with the mordant. The aging process was formerly conducted in large chambers and consumed several weeks. It is now performed in steam 'agers,' much more rapidly; but cloth that is rapidly aged does not hold its color as well as when the operation is conducted more slowly. Dunging is a passing of the cloth through solutions of sodium phosphate, arseniate, or silicate, these chemicals being now employed in place of the somewhat offensive cow-dung. The composition of the dye-bath is described under DYEING.

For the third, or discharge style of printing, the *discharges* are simply substances printed upon the goods, the whole of which has been mordanted, so that the mordant is removed from the printed spots, and when the goods are finally dyed the printed figures will be white, while the background will be the color naturally produced by the dye and mordant.

In the fourth, or reserve, style of printing, substances are printed upon the fabric which will prevent the fixation of color in those places. Reserves are of two general kinds: chemical, such as citric acid, and mechanical, such as pipe-clay, beeswax, or other inert substance.

These four general methods of textile printing, briefly outlined above, are susceptible of endless modification and combination. Rothwell (see bibliography) gives ten possible methods which he groups under seven 'styles.' Many of them are applicable only to cotton.

STATISTICS. According to the United States Census for 1900, 1,233,191,438 yards of cotton were printed in the United States in 1900, as against 722,257,451 yards printed in 1890. During 1900, 10,239,606 yards of silk goods were also printed in this country. In the same year, 334 printing machines were in operation in factories devoted exclusively to printing and finishing textile fabrics, of which 321 were for the printing of cotton fabrics and the remainder for the printing of silk. It is evident from these figures that the printing of woolen and mixed goods, which is a flourishing industry in Europe, has not yet become established in America.

BIBLIOGRAPHY. Consult: Georgievic, *Chemical Technology of Textile Fabrics*, trans. by Salter (London, 1902); Rothwell, *Printing of Textile Fabrics* (Philadelphia, 1902); Santone, *The Printing of Cotton Fabrics* (London, 1897); Duerr, *Bleaching and Calico Printing* (London, 1896); Sadtler, *Industrial Organic Chemistry* (Philadelphia, 1900). The last named book contains a complete bibliography chronologically arranged, from 1874 to 1900.

TEXTUAL CRITICISM (OF., Fr. *textuel*, from Lat. *textus*, text, composition, fabric, from *texere*, to weave). The criticism of existing texts of literary works with a view to the detection of errors which have crept in, and the restoration of the reading intended by the author. Such criticism may be necessary in the case of any literary production which is no longer under the control of its author, but it finds its most difficult problems in the Old and New Testaments, the Greek and Latin authors whose works are preserved to us, in the older monuments of the national literatures, and in the texts of some moderns, e.g. Chaucer and Shakespeare.

The criticism of the texts of Greek and Latin authors, to take them as examples, is based first of all on a careful study and comparison of all existing manuscripts, then on quotations and unconscious reminiscences of the writer in question, in other authors, and finally on such helps as may be obtained from ancient commentaries, *Scholia* (see SCHOLIASTS), or from early translations, such as the Latin and Arabic renderings of certain works of Aristotle. Most of our classical manuscripts belong to the period from the ninth to the fifteenth century; a few are earlier, one or two possibly as old as the fourth century, and some are later, but ordinarily the manuscripts of the fifteenth and sixteenth centuries are of little or no value. No existing manuscript is free from error. The scribes often did their work mechanically and ignorantly, so that blunders were easily made; these were then perpetuated and spread by each successive copyist. Such errors may be corrected by comparison with a manuscript which does not contain the identical blunders; but in case all existing manuscripts are descended from the same incorrect original, the same errors will probably appear in all. In such case, if the subsidiary aids named above fail, the only resort is to conjectural emendation. Or it may happen that a number of manuscripts have different readings in the same passage, all intelligible. The problem then is to determine which of the several readings is the one intended by the author.

Errors in manuscripts may be divided into: (1) Errors of Omission, (2) Errors of Insertion, (3) Errors of Substitution, (4) Errors of Transposition, (5) Errors of Emendation, (6) Errors due to the Confusion of Letters or Contractions.

(1) *Errors of Omission.* The simplest form of this class of errors is that known as *haplography*, when of two identical letters, syllables, or words only one is written; e.g. Plautus, *Miles Gloriosus* 54, *si viverent* for *sivi viverent;* Vergil, *Georgics*, 4, 311, *magis aera carpunt* for *magis magis aera carpunt*. The omission of a syllable, word, or passage may also be due to the inexcusable carelessness of the scribe, a failure to understand, a defect in the archetype, etc. Most such omissions come under the head of what is technically known as *lipography*. Examples are furnished by Vergil, *Æneid*, 4, 491, *descere* for *descendere;* 6, 708, *indunt* for *insidunt*. The omission of clauses or sentences in prose, or of whole lines in poetry, is frequently occasioned by the similar endings of clauses or verses (*homœoteleuton*), or by similar words in the same position within the lines, so that the eye of the scribe jumped from one to the other. In Plautus's *Bacchides*, the oldest manuscript lacks two entire verses, owing to the fact that v. 507 has *atque* and v. 509 *usque* in the same position. The texts of Lucretius and Vergil also furnish a number of examples of this kind of error.

(2) *Errors of Insertion.* One of the most common forms of this class of errors is that known as *dittography*, whereby a letter, syllable, or word is written twice. A case of double dittography is furnished by the Palimpsest of Cicero, *De Republica*, 2, 57, *secvtvtvsecvtvs* for *secutus*. Often an explanatory word, gloss, or passage, either interlinear or marginal, is inserted in the body of the text. Thus in Plautus's *Truculentus*, v. 79, is an unmetrical line, *Phronesium, nam phronesis est Sapientia*, which apparently was originally a marginal gloss in explanation of the proper name *Phronesium* in v. 77. Or any marginal note may be incorporated by the scribe, such as *Caput*, chapter, *nota*, take notice, *deest*, there is lacking, etc. In some cases insertions have been made with fraudulent intent. There is an ancient tradition that the mention of Athens in the *Iliad*, 2, 553ff., was interpolated to give the dignity of antiquity to the capital of Attica. Syntactical corrections, both intentional and unintentional, from a difficult to an easier construction are not uncommon; and Renaissance scholars seem often to have been more concerned with making a readable than a correct text.

(3) *Errors of Substitution.* This class of mistakes may arise from various causes. An explanatory gloss may have been substituted for the word it explains, as in Vergil, *Eclogues*, 6, 40, *rara per ignaros errent animalia montis*, where some manuscripts have *rara per ignotos*, etc., *ignotos* being evidently a gloss substituted by some copyist for the correct *ignaros*. In the case of archaic writers like Plautus, a classical word may have ousted the early form; an example is furnished by *Amphitruo*, 631, where one manuscript has the classical *simul* for the archaic *simitu*. The earlier form is correctly given by two manuscripts, while the writer of a fourth first copied correctly *simitu* and then changed it to *simul*. Not infrequently, also, a word has been substituted from the context or from a parallel passage which lingered in the copyist's mind. Further, the mediæval scribes, being monks, might corrupt a passage by substituting a word from a similar passage in the Bible. A famous example is that of Horace C., 3, 18, 11., where the monk who was writing a manuscript which afterwards became the archetype of a considerable class had in mind Isaiah xi. 6, *habitabit lupus cum agno et pardus cum hædo accubabit*, and so substituted *pardus* for *pagus* in the passage *festus in pratis vacat otioso cum bove pagus*. The most common cause of this class of errors, however, is the confusion of similar words: *addit* and *adit*, *adesse* and *ad sese*, *hospitium* and *hostium*, *precor* and *prætor*, etc.

(4) *Errors of Transposition.* These errors, whether of letters, syllables, words, or lines, are very common in classical manuscripts. They are due most often to the carelessness of the copyist whose eye traveled faster than his pen. Transposed letters and syllables are easily detected by any one familiar with the language; transposed words are not so readily discovered in prose as in verse, where the transposition usually spoils the metre, e.g. the reading of certain manuscripts of Horace C. 3, 13, 14, *ternos ter attonitus cyathos petet vates* will not 'scan,' but the metre is perfect when the correct *cyathos attonitus* is read. The transposition of entire lines is generally due to the fact that the copyist carelessly dropped the line or lines, and later, on discovering his error, inserted the missing lines out of place, often without any indication of the misplacement. Lucretius and Vergil furnish many excellent examples. Finally, one or more entire pages may be misplaced either because the scribe carelessly omitted a page or because the sheets of the archetype had become disturbed before the copy was made. A well-known example of the last is furnished by Lucretius, where the error enabled Lachmann to determine the size of the lost archetype from which the extant manuscripts are descended.

(5) *Errors of Emendation.* This class has been touched on under Sections 2 and 3. They occur chiefly in manuscripts dating from the ninth century or later, and are especially common in manuscripts written by Renaissance scholars. These errors may arise simply from the wrong division of words, as in Seneca, *Epist.*

89, 4, where the copyist senselessly divided *quid amet* of his original into *quidam et.* Madvig, by a stroke of the pen, first restored the correct *quid amet.* While Alcuin's efforts to restore Latin orthography were for the most part beneficial, they also led to certain errors, mostly due to the substitution of a familiar for an unfamiliar word, e.g. *facile* for *facete*, etc. Renaissance scholars of the fifteenth and sixteenth centuries not only 'corrected' passages, but also filled out lacunæ, supplied missing scenes, etc.

(6) *Errors Due to the Confusion of Letters and Contractions.* These mistakes are few in capital and uncial writing, but in minuscule writing the possibilities of the confusion of letters are much greater, and the use of contractions constantly increased with the centuries. A treatment of the subject is impossible here, as it belongs to paleography (q.v.).

BIBLIOGRAPHY. For a bibliography of the text criticism of the Bible, see articles on BIBLICAL CRITICISM, NEW TESTAMENT, etc. On the text criticism of classical authors, consult Boeckh, *Encyklopädie und Methodologie der philologischen Wissenschaften* (2d ed., Leipzig, 1886); Madvig, *Adversaria Critica* (1870); Cobet, *Variæ Lectiones* (1873); Blass in vol. ii. of Von Mueller's *Handbuch der klassischen Altertumswissenschaft* (2d ed. 1892); Lindsay, *Introduction to Latin Textual Emendation* (1896); and the best critical editions of the separate authors.

Such works as Skeat's edition of Chaucer and Furness's variorum edition of Shakespeare give an excellent idea of the textual problems presented by these two authors.

TEZCUCO, tĕs-kōō'kō, or **TEXCOCO.** A town in the State of Mexico, sixteen miles east of the city of that name, east of the Lake of Tezcuco. It is on the Interoceanic Railway, whose shops form its chief industry. It also has glass and cotton manufactures. In the plaza is a monument to Netzahualcoyotl, the most famous Tezcucan King. Previous to the Spanish conquest the place was occupied by a Chichimeca tribe, known as the Texcucans or Acolhuans, who claimed a preëminence in Nahuatl culture and civilization. Here, in 1521, Cortés built the brigantines with which he besieged Mexico. Its population is about 2500.

TEZIUTLAN, tä'sā-ōōt-län'. A town of the State of Puebla, Mexico, seventy-six miles northeast of Puebla, and thirty-seven miles northwest of Jalapa (Map: Mexico, K 8). Its streets are steep and irregular. It has an extensive commerce with Mexico City and with the towns of Vera Cruz. Population, in 1895, 9776.

THACH'ER, JOHN BOYD (1847—). An American manufacturer, writer, and book collector, born in Ballston, N. Y. He graduated at Williams College in 1869, and settled at Albany, N. Y., where he became a successful manufacturer of car wheels. In 1884-85 he was a Democratic member of the State Senate, taking an especial interest in tenement house reform; and in 1886, 1887, 1896, and 1897 was Mayor of Albany. He devoted much of his attention to the study of early American discovery. His publications include: *The Continent of America, Its Discovery and Its Baptism; An Essay on the Nomenclature of the Old Continents, etc.* (1896); a drama, *Charlecote; or The Trial of William Shakespeare* (1896); *The Cabotian Discovery* (1897); and *Christopher Columbus, His Life, His Works, His Remains, together with an Essay on Peter Martyr of Anghera and Bartolomé de las Casas, the First Historians of America* (2 vols., 1903), an important work, made especially valuable by the publication of many original documents and of various early accounts of the life and voyages of Columbus.

THACHER, THOMAS ANTONY (1815-86). An American educator, born in Hartford, Conn. He graduated at Yale in 1835, was appointed tutor there in 1838, and, in 1842, professor of Latin, a position which he held during the remainder of his life. In 1843 he went to Germany and for a time gave instruction in English to the Crown Prince of Prussia and to Prince Frederick Charles. He was one of the editors of *Webster's Dictionary*, and also edited many of the Latin classics, such as Cicero's *De Officiis* (1850), and made an English version of Madvig's *Latin Grammar.*

THACKERAY, ANNE ISABELLA. See RITCHIE, ANNE ISABELLA.

THACKERAY, WILLIAM MAKEPEACE (1811-63). A famous English novelist. He was born in Calcutta, where his father was at the time in the service of the East India Company, July 18, 1811. At the age of six the boy was sent to England, his father having meantime died, and placed in the care of an aunt; but in 1821 his mother returned with her second husband and settled near Ottery Saint Mary in Devonshire. The boy regarded her as 'a daughter of the gods,' and his stepfather, it is asserted, was the original of Colonel Newcome. After attending two small schools, Thackeray entered Charterhouse, of which also he has given a vivid description in *The Newcomes*, and remained there six years (1822-28). Then he spent a little over a year at Cambridge, as a member of Trinity College and of the brilliant society of which Tennyson (q.v.) was another ornament. After this he spent two years abroad, staying some time at Weimar, where he met Goethe. On his return to England he studied law for a while at the Middle Temple, which furnished some of the material for *Pendennis.* On his coming of age, he inherited a fortune estimated at £20,000, but much of it was lost by the failure of an Indian bank, and he had to depend on his own exertions for a living. In 1833 he became editor and proprietor of the *National Standard*, a periodical devoted to art and literature, but it lived only about a year, after which he spent some time in Paris studying art. He offered to illustrate *Pickwick*, but his services were declined by Dickens. In 1836 he became Paris correspondent for the *Constitutional*, and married Isabella, daughter of Colonel Shawe of the Indian army.

After his marriage he settled in London, and contributed regularly to *Fraser's Magazine.* His first book was *Flore et Zéphyre by Théophile Wagstaff* (1836), with nine comic plates from his own drawings. Some of the satirical character sketches and humorous tales which he wrote for *Fraser's* were collected, as in *The Yellowplush Papers* (1838), *The Paris Sketch-Book* (1840), and *The Irish Sketch-Book* (1843). In 1842 he began writing for *Punch*, to which he contributed nearly four hundred sketches. The most successful were *Jeames's*

Diary (1845-46), the *Prize Novelists* (1847), and the *Snob Papers* (1846-47). Thackeray had now proved himself a master of burlesque, and an acute critic of contemporary manners. In their kind nothing could be better than the *Prize Novelists* and *Rebecca and Rowena*, in which he exaggerates the weaknesses of Bulwer, Disraeli, Lever, Cooper, and Scott. *Barry Lyndon*, a mock defense of gambling (1844), is superb. He had also begun, as he continued throughout life, to write occasional verse, commonly in the ballad measure, at will grave and pathetic or richly humorous.

In 1846-48 *Vanity Fair* appeared in monthly parts, and Thackeray assumed his place in English literature by the side of Fielding. This, with his other great novels, *Pendennis* (1849-50), *Henry Esmond* (1852), and *The Newcomes* (1854-55), shows him at the height of his power. Somewhat inferior, but still to be mentioned in this context, are *The Virginians* (1858) and *The Adventures of Philip* (1862). *Henry Esmond*, especially, has taken rank by universal consent at the very head of English historical fiction. To say nothing of its other merits, it is an absolute faithful reproduction, not only of the language, but of the thought and the manners of the early eighteenth century. This was a period by which Thackeray was always strongly attracted; Addison, Swift, Steele, and the eighteenth-century novelists were his masters in literature. He even thought of writing a history of the century; and his studies took shape in the delightful lectures on *The English Humorists*. These he delivered in America in 1852 and 1853, with such success that he came again in 1855 with *The Four Georges*. In 1857 he tried for Parliament, standing for Oxford in the Liberal interests, but was fortunately defeated. In 1860 he became the first editor of the *Cornhill Magazine*, for which he wrote his last novels and the *Roundabout Papers* (1860-63), a series of essays and sketches which are the best revelation of the man and of his large heart.

Though not far beyond middle life, Thackeray felt the burden of years, and resigned the editorship of the *Cornhill* in April, 1862. On the morning of December 24, 1863, he was found dead in his bed. He was admirable both as a man and as a novelist. Tennyson called him 'lovable' and 'noble-hearted.' So said Carlyle, and all who knew him well. He has been often called a cynic; and indeed he was unsparing in the fierceness with which he plied the lash on anything which savored of sham or pretense, and his keen vision detected alloy in the finest natures. Yet there is a tremendous contrast between his satire and that of Swift, a truer type of the cynic, who hated and despised human nature and rejoiced in laying bare its weaknesses. Thackeray wrote always with a noble tenderness and an utter reverence for all that was good and true. Yet it must be admitted that, almost without exception, the strongest characters in his novels are the bad ones, and that he has drawn scarcely a woman whom we can love and admire without qualification.

This probably comes, however, less from what has been called his cynicism than from a more indisputable defect—his lack of poetic imagination. Thackeray was a realist; in some ways he pointed out the path to the modern English realistic school. "I have no brains above my eyes," he said himself; "I describe what I see." He describes the life of the upper classes, as Dickens that of the lower; and between them they give an unrivaled picture of English life in the middle of the nineteenth century, with its characteristic notes—one may say, for the first time in the history of literature, a picture of a society whose chief concern is the making or the spending of money. The interest in social questions which he was among the first to import into fiction has never died out; though Charlotte Brontë's enthusiastic picture of him (in the preface to the second edition of *Jane Eyre*) as a prophet "who comes before the great ones of society much as the son of Imlah came before the throned kings of Judah and Israel, and who speaks truth as deep, with a power as prophet-like and as vital, a mien as dauntless and as daring," may seem to us overdrawn. The most indisputable of his qualities is his unfailing mastery of a singularly pure, perfect, and simple style—the natural unstrained expression of his thoughts, however lofty or however homely they may have been. "He blew on his pipe, and words came tripping round him, like children, like pretty little children who are perfectly drilled for the dance; or came, did he will it, treading in their precedence, like kings, gloomily." His style, like the vividly realized world of his characters, is the direct outgrowth of what has been called "perhaps the most interesting personality that has expressed itself in prose."

Bibliography. Out of respect for Thackeray's request, no authorized biography of him has ever been written. His daughter, Mrs. Richmond Ritchie, however, has written sketches for each volume of the Biographical Edition of his works (London, 1898-99), and his son-in-law, Sir Leslie Stephen, wrote the article on him in the *Dictionary of National Biography*. Another good edition of the *Works* is that with introduction by Walter Jerrold (New York, 1902). Anthony Trollope's *Thackeray*, in the "English Men of Letters" series (London, 1879), is valuable for personal impressions. One of the latest biographies and certainly the most complete one is by Lewis Melville (London, 1899). For early work, not found in the Biographical Edition, see *Unidentified Contributions of Thackeray to Punch*, ed. by Spielmann (ib., 1899), and *Thackeray's Stray Papers*, 1821 to 1847, ed. by Melville (ib., 1901). Consult also Hunter, *The Thackerays in India* (ib., 1897); the biography by Merivale and Marzials in the "Great Writers" series (ib., 1891); Whibley (ib., 1903); Crowe, *Homes and Haunts of Thackeray* (ib., 1897); id., *With Thackeray in America* (ib., 1893); Wilson, *Thackeray in the United States* (New York, 1904). For criticism, consult especially the essays by Harrison, in *Early Victorian Literature* (London, 1895); Brownell, in *Victorian Prose Masters* (New York, 1901); Scudder, *Social Ideals in English Letters* (Boston, 1898); Lilly, in *Four English Humorists of the Nineteenth Century* (London, 1895); Skelton, *Table Talk of Shirley* (ib., 1895).

THADDÆ'US (Lat., from Gk. Θαδδαῖος, *Thaddaios*). The name assigned to one of the twelve Apostles in the list given in Mark iii. 16-19. In the corresponding list in Matt. x. 2-4 the name is Lebbæus, while in Luke vi. 14-16, Acts i. 14 it is given as Judas [son] of James. Some of these readings are not above suspicion, as the manuscripts differ considerably. It is possible that the original name was Judas Thaddæus, for which Judas Lebbæus was often used, Lebbæus being a euphemism for Thaddæus. Eusebius makes Thaddæus one of the seventy, and sent by Thomas the Apostle to Abgar, King of Edessa, to heal him and to evangelize his people. Eusebius claims to have taken this story direct from Syrian sources. The Syrian tradition embodied in the "Doctrine of Addai" makes Addai, one of the seventy, the apostle of the Syrian Church.

THAD'DEUS OF WAR'SAW. A romance by Jane Porter (1803). The chief character is Count Thaddeus Sobieski, who devotes himself to the liberation of Poland and becomes a refugee teacher of languages in London.

THAER, târ, ALBRECHT DANIEL (1752-1828). A noted German agriculturist, whose work revolutionized certain forms of farm management and animal production of his day. Born at Celle, Hanover, he studied medicine and philosophy at Göttingen, and succeeded his father as Court physician, but early turned his attention to agriculture. He worked out a new system of farm management on his small farm in Celle, where he demonstrated the value of more intensive farming, stall feeding of soiling crops, and the rotation of crops in connection with potato culture. He was especially active in applying scientific principles to agriculture, systematizing agricultural accounts, introducing agricultural implements and appliances, and improving sheep for the production of fine wool. The fame of his system of farm management attracted large numbers of young agriculturists, to whom he began delivering lectures in 1802, out of which grew the Agricultural Institute of Celle. In 1804 he bought the Möglin Manor, near Berlin, for the purpose of demonstrating how under his system an exhausted farm could be brought to a high state of production, and in 1806 founded there an agricultural institute, which became celebrated. He was appointed professor at the University of Berlin and councilor in the Ministry of the Interior in 1810, started his famous sheep-breeding farm at Möglin in 1811, and from 1815 on had charge of the royal sheep-breeding farms, which he greatly improved. Resigning his professorship in 1818, he devoted himself to his institute at Möglin, which was raised to a Royal Academy of Agriculture in 1824. Thaer founded and edited the *Annalen der niedersächsischen Landwirtschaft* (1798-1804), and was the author of a large number of treatises on agriculture, several of which are characterized as epoch-making. The *Einleitung zur Kenntnis der englischen Landwirtschaft* (1798; 3d ed. 1816) made his name first more widely known, and his great work *Grundsätze der rationellen Landwirtschaft* (1809-10; new ed., 1880) was translated into most of the European languages. Monuments to his memory were erected at Leipzig, Berlin, and Celle. For his biography, consult Körte (Leipzig, 1839).

THAI, tä'ē (free). A group of peoples of Farther India, including the Thos (q.v.) and Muongs (q.v.) in the northeast (Tongking and China), the Shans (q.v.) in the northwest (Burma, Siam, China), the Laotians (see LAOS) in the south (the Laos States, French Siam), and the Siamese in the southwest (Siam). The term Thai is applied by certain writers to the Siamese in particular, but their proper appellation is rather Little Thai, their ancestors, the Shans, being called the Great Thai. The Thai peoples speak languages belonging to the same linguistic stock. The Siamese present the Thai type, much changed by intermixture with Khmers, Hindus, Kuis, Malays, and other stocks. They are of medium stature and brachycephalic, while the Laotians are shorter and less broadheaded. Among some of the Shan tribes the primitive Thai type is best preserved. The Thai peoples have shown much political capacity. Consult: Pellegoix, *Description du royaume Thai ou Siam* (Paris, 1854); Bastian, *Die Völker des östlichen Asiens* (Leipzig, 1866); Hellwald, *Hinterindische Länder und Völker* (ib., 1880); Forbes, *Comparative Grammar of the Languages of Further India* (London, 1881); Colquhoun, *Across Chrysé* (ib., 1883); Diguet, *Etude de la langue Tai* (Paris, 1896).

THA'IS (Lat., from Gk. Θαίς). An Athenian courtesan, famous for her wit and beauty. She accompanied Alexander the Great on his expedition into Asia, and, according to Cleitarchus, induced him, during a festival, to set fire to the palace of the Persian kings at Persepolis. After the death of Alexander she lived with Ptolemy Lagi, King of Egypt, who is said (by Athenæus) to have married her, and by whom she had two sons, Leontiscus and Lagus, and a daughter, Irene.

THALBERG, täl'bĕrk, SIGISMUND (1812-71). A distinguished German pianist, born at Geneva, Switzerland. He was the natural son of Prince Moritz Dietrichstein and received his musical education from 1822 on at Vienna, where he studied under Hummel and composition under Sechter. Making his appearance in public in 1830 with brilliant success, he was appointed chamber virtuoso to the Emperor of Austria in 1834, and the following year appeared in Paris, as a rival of Liszt. After a succession of triumphs in England, Russia, and Italy, in Brazil (1855-56), and in the United States (1856-58), he retired to his home at Posilippo, near Naples, whence he only once more undertook a concert tour to Paris and London in 1862 and to Brazil in 1863. Perhaps his strongest point as a pianist was his mastery of the legato singing tone. In every other respect his style, though brilliant, was shallow.

THALER, tä'lẽr. A German coin, first struck at Joachimsthal, Bohemia, in 1519 and hence called Joachimsthaler, whence the modern name. The thaler, divided into thirty silbergroschen of 12 pfennigs, was the German unit of value until 1873, when the mark was adopted. The thaler is still in circulation with the value of 3 marks, about 69 cents.

THALES, thā'lēz (Lat., from Gk. Θαλῆς). The earliest of the Greek philosophers, and the founder of the Ionic or Physical school. He flourished in the first half of the sixth century B.C. He was a native of Miletus, in Asia Minor, and is said to have been of Phœnician descent. He was reckoned one of the Seven Wise Men, possessed sufficient astronomical knowledge to enable him to predict the eclipse of the sun in the reign of the Lydian King Alyattes, and was an excellent mathematician. He was famed also for his practical and political wisdom, but his chief renown is due to the fact that he was the first man among the Greeks to set aside the current explanations of the universe and to look for a first principle which might be grasped through reason. This first principle (*ἀρχή*) he regarded as water, which was the source of all things, and that into which all things were resolved. The importance of his speculation lies in the fact that he turned men to reasoning about the world and to an effort to find the significant principle which lay behind the varied phenomena. Thales left no writings, and even among the Greeks considerable doubt prevailed as to his exact teachings. Consult: Ritter and Preller, *Historia Philosophiæ Græcæ* (7th ed., Gotha, 1888); Zeller, *Philosophie der Griechen*, vol. i. (4th ed., Berlin, 1900); Ueberweg, *History of Philosophy*, Eng. trans., vol. i. (New York, 1887).

THALI′A (Lat., from Gk. *Θάλεια*, *Thaleia*, from *θάλεια*, *thaleia*, luxuriant, blooming, from *θάλλειν*, *thallein*, to bloom; connected with Alb. *dal*, I bloom). One of the nine Muses (q.v.). In the late assignment of specific functions to the Muses, she became the Muse of Comedy, and was represented as holding the comic mask.

THALLIUM (Neo-Lat., from Gk. *θαλλός*, *thallos*, green shoot). A metallic element discovered by Crookes in 1861, and independently by Lamy in 1862. It was originally found by the bright green line which its compounds give when examined by the spectroscope. It occurs as the selenide in combination with copper and silver, in the rare mineral *crookesite*, in small quantities in copper and iron pyrites, and in the seleniferous deposits from sulphuric acid; also in minute quantities in other minerals, and in certain mineral waters. It may be prepared from the flue-dust of sulphuric acid works in which pyrites containing thallium are burned, by treating the dust with water acidulated with sulphuric acid, concentrating the resulting solution, and precipitating the thallium by zinc. Thallium (symbol, Tl; atomic weight, 204.15) is a soft, crystalline, lead-like metal, with a specific gravity of 11.8, and a melting point of 290° C. (554° F.). When exposed to the air it tarnishes rapidly, becoming coated with a thin layer of oxide, which preserves the rest of the metal. It combines with oxygen to form a monoxide and a trioxide, which yield corresponding series of salts, known as the *thallous* and *thallic* compounds. The compounds of thallium are very poisonous, producing symptoms like those of lead poisoning. Their presence in a given substance may be readily detected by the beautiful green color which they impart to a non-luminous gas flame.

THALLOPHYTES (from Gk. *θαλλός*, *thallos*, green shoot, from *θάλλειν*, *thallein*, to bloom + *φυτόν*, *phyton*, plant). One of the four great divisions of the plant kingdom, containing the algæ and fungi (qq.v.). In theory the thallophytes are distinguished from the other groups by having a thallus body. As a matter of fact, there are many thallophytes with upright stem-like axes, root-like regions of attachment, and lateral members which function as and resemble leaves, although not at all homologous with the leaves of higher plants. The best examples of these are found among the Phæophyceæ, Rhodophyceæ, and Charales (qq.v.). The thallophytes are readily distinguished from the bryophytes above them by the absence of the peculiar female sexual organ (archegonium, q.v.), and the sexless phase or plant (sporophyte, q.v.) characteristic of the bryophytes and pteridophytes. They are, therefore, defined more through the absence of structures found in the higher plants than by any agreement among themselves.

THALLUS (Lat., from Gk. *θαλλός*, green shoot). A plant body whose vegetative structure is not differentiated into such organs as stem, leaf, etc. Most of the algæ and fungi (thallophytes, q.v.) have thallus bodies. Many liverworts, the sexual phase (gametophyte) of ferns, and even certain reduced and simplified flowering plants such as the duckweed (Lemna), present a thalloid structure. On the other hand, certain thallophytes, especially among the brown and red algæ, have bodies differentiated far beyond the limits of the definition of a thallus.

THAMES, těmz. The most important river in Great Britain, flowing with a southeastern trend through the southern portion of the Kingdom and passing through London (Map: England, G 5). Its remotest source, the Churn, rises on the southeast slope of the Cotswold Hills, in Gloucester, five miles south of Cheltenham, and after flowing southeast for 20 miles receives the Thames, or Isis, from the west. The Thames then flows east-northeast for about 35 miles, and curving southeast, passes Oxford and flows on to Reading, where it again changes its course to a generally eastward trend. A few miles below Gravesend it expands into a wide estuary, and enters the North Sea. The length of the Thames is about 250 miles. At London Bridge the width of the river is about 290 yards; at Woolwich, 490 yards; at Gravesend pier, 800 yards; 3 miles below Gravesend, 1290 yards; at Nore Light, 6 miles; and at its mouth, between Whitstable and Foulness Point, about 8 miles below the Nore; the estuary is 18 miles across. The river is navigable for barges to Lechlade, upward of 200 miles above its mouth, and it is connected with several important canals, affording communication with the west and south coasts, and with the interior of the country. Its upper reaches and islands are much resorted to for their sylvan beauty, and pleasure steamers ply daily between Kingston, Henley, and Oxford. Vessels of 800 tons can reach Saint Katharine's docks, London, those of 4000 tons can ascend to Blackwall, while by the dredging operations that have been carried out, vessels of 22 feet draught are now accommodated in the Albert and Victoria docks. The volume of traffic on the river was estimated in 1900 at 30,000,000 tons. The Thames is also the main source of the water supply of London, as much as 130,000,000 gallons a day being withdrawn near Hampton for this purpose. The part of the river immediately below London Bridge is called the *Pool*, and the part between the bridge and Blackwall is called the *Port*. Two embankments have been formed, one on the north shore from Blackfriars Bridge to Westminster, and one on the south shore from Westminster Bridge to Vauxhall. Among the places on the Thames besides those above mentioned are Windsor, Eton, and Richmond. An extensive bibliography includes: *The River Thames from Oxford to the Sea* (London, 1859); Cassell, *Royal River*, illustrated (ib., 1885); and annual *Reports* of the Conservators of the River Thames (ib.). See LONDON.

THAMES, tĕmz, or **GRA'HAMSTOWN**. A gold-mining township on the east coast of an inlet in the Hauraki Gulf, North Island, New Zealand, 46 miles east-southeast of Auckland (Map: New Zealand, E 2). Population, in 1901, 4009.

THAMES, *local pron.* thămz. A river of eastern Connecticut (Map: Connecticut, G 4). It is a broad and navigable tidal estuary, 15 miles long, receiving the Shetucket, and entering Long Island Sound at its eastern end. At its mouth stands New London, and at its head Norwich. The Shetucket and its branches supply power for considerable manufactures.

THAMES, BATTLE OF THE. A battle fought at the Moravian settlement on the Thames River in the township of Oxford, Ontario, Canada, on October 5, 1813, during the War of 1812, between an American force of about 3000 (largely Kentucky volunteers) under Gen. William H. Harrison and a British force of about 650 under General Proctor, aided by a force of Indians, whose number has been variously estimated at from 800 to 2000, under Tecumseh. For several days Proctor had retreated before Harrison, but had at last decided to give battle and had drawn up his troops in readiness to receive the advancing Americans. The battle was begun and virtually decided by a cavalry charge under Col. Richard M. Johnson, who has been credited with having personally killed Tecumseh. The British soon broke, and fled wildly from the field, with Proctor at their head, and the only serious resistance was that offered by the Indians. The loss of the Americans in killed and wounded was reported by Harrison as 29; that of the British was about 35, while a large number were taken prisoners. The loss of the Indians is not definitely known. Proctor was soon afterwards disgraced for his conduct during the battle. By this battle the right division of the British army in Upper Canada was greatly weakened, and as the result of Tecumseh's death the powerful Indian confederacy in the Northwest against the United States was broken up.

THAMES EMBANKMENT. An important public work in London consisting of broad roads along the Thames, protected on the river side by massive granite walls. The finest portion, the Victoria Embankment, on the north bank of the river, between Blackfriars Bridge and Westminster, was constructed in 1864-1870. It has a carriageway 64 feet wide, flanked by broad foot-walks, and is planted with trees and adorned with gardens containing statues of notable men. The obelisk known as Cleopatra's Needle stands near the Adelphi Steps. The Albert Embankment, on the right bank of the river, between Westminster Bridge and Vauxhall Bridge, with a 60-foot roadway, was completed in 1869, and the Chelsea Embankment, on the left bank, in 1873.

THAM'YRIS (Lat., from Gk. Θάμυρις). A Thracian bard who challenged the Muses to a contest of singing. He was overcome by them and as a punishment was blinded and deprived of his gift of song.

THAN'ATOP'SIS (Neo-Lat., from Gk. θάνατος, *thanatos*, death + ὄψις, *opsis*, sight, view). A well-known poem by William Cullen Bryant, written in 1811, and published in 1817.

THAN'ATOS (Gk. θάνατος, death). The Greek god of death, called by the Romans Mors, and twin brother of Sleep (see SOMNUS), with whom he is usually represented.

THANE (AS. *þegen*, *þegn*, OHG. *degan*, attendant, servant, soldier, Ger. *Degen*, heroic warrior; connected with Gk. τέκνον, *teknon*, Skt. *tōka*, child), or THEGN. The name by which the class of minor nobles was known in Anglo-Saxon times. Any freeman who had acquired five hides of land and a special appointment in the King's hall became a thane. He was bound to service in war, but was protected by a higher wergild (q.v.) than the ordinary freeman. Like the gesith, who was the noble living with the King, the thane was a development from the Germanic *comitatus* or noble follower of some chief, described by Tacitus. After the Norman Conquest the thanes were merged in the class of knights. Consult Stubbs, *Constitutional History of England*, vol. i. (6th ed., Oxford, 1897).

THAN'ET, ISLE OF. The northeast corner of Kent (q.v.), England, separated by the river Stour and its branches, and bounded on the north and east by the sea (Map: England, H 5). It is 10 miles in length and from 4 to 8 in breadth. Agriculture is successfully pursued. It contains the well-known watering places, Ramsgate, Margate, and Broadstairs. Population, in 1891, 57,800; in 1901, 68,350. Consult: Simson, *Historic Thanet* (London, 1891).

THANET, OCTAVE. The pseudonym of the American novelist Alice French (q.v.).

THANKSGIVING DAY. A day specially set apart for the giving of thanks. After the first harvest of the New England colonists in 1621 Governor Bradford made provision for their rejoicing specially together with praise and prayer. In 1623 a day of fasting and prayer in the midst of drought was changed into thanksgiving by the coming of rain during the prayers; gradually the custom prevailed of appointing thanksgiving annually after harvest. These appointments were by proclamation of the Governors of the several New England colonies. During the Revolution a day of national thanksgiving was annually recommended by Congress. Since 1864 the President has appointed a day of Thanksgiving (usually the last Thursday of November), and his proclamation has generally been followed by similar proclamations from the Governors of several States. The credit of this change belongs to Mrs. Sarah Josepha Hale, editress of *Godey's Lady Book* (Philadelphia), and the first President to adopt it was Abraham Lincoln. Consult Love, *The Fast and Thanksgiving Days of New England* (New York, 1895).

THAR, thär (East Indian name), or TAHR. A goat-antelope (*Hemitragus Jemlaicus*) allied to the Nilgiri goat (q.v.), which inhabits the higher forest regions of the southwestern Himalayas. It is about 3⅓ feet tall. It is usually dark brown, but variable, and lighter in winter. The female is singular in having four teats. The horns are black and bend backward. This species is known in Kashmir as 'kras,' and in Nepal as 'jharal.' See Plate of GOAT-ANTELOPES.

THA'SOS (Lat., from Gk. Θάσος). The most northerly island in the Ægean Sea, a few miles off the coast of Macedonia. Circumference, about 40 miles; population, about 12,000, scattered over a dozen villages. Thasos is mountainous, the chief summit, Hypsarion, being about 3400 feet in height, and is, on the whole, barren. It exports some oil, honey, and timber. The island seems to have been the seat of a Phœnician trading-post in very early times, but near the end of the eighth century B.C. it was colonized by Parians. The settlers had a severe struggle with the natives before they finally secured possession of the island and its rich gold mines. They later secured a footing on the neighboring coast, where gold was also found, and in consequence became very wealthy. Thasos submitted to the Persians, but after the defeat of Xerxes joined the Delian League. In consequence of an attempt to revolt, it was reduced by the Athenians, who retained possession of it for the greater part of the time until the end of the third century B.C., when it passed into the hands of Macedon. After the battle of Cynoscephalæ (B.C. 197) Thasos long enjoyed autonomy under the Romans. Consult: Perrot, *Mémoire sur l'île de Thasos* (Paris, 1864); Conze, *Reisen auf den Inseln des thrakischen Meeres* (Hannover, 1860); Tozer, *Islands of the Ægean* (Oxford, 1890); Jacobs, *Thasiaca* (Göttingen, 1893).

THATCH'ER, HENRY KNOX (1806-80). An American naval officer, born at Montpelier, near Thomaston, Me. He entered the navy as a midshipman in 1823; rose through successive grades to the rank of commodore in 1862 and to that of rear-admiral in 1866. In 1862 he was placed in command of the steam frigate *Colorado*, with which he joined the North Atlantic Squadron. In December, 1864, and January, 1865, he commanded the first division of Admiral David D. Porter's fleet in the attacks upon Fort Fisher, and showed so much ability that he was soon afterwards appointed acting rear-admiral and assigned to succeed Farragut in command of the West Gulf Squadron. In coöperation with Major-General Canby he then besieged and captured the city of Mobile with its remaining fortifications and the fleet of Confederate ironclads. Soon afterwards he occupied Galveston without opposition, and so completed the conquest of the Gulf coast. In 1866 he was given command of the North Pacific Squadron, a position which he held until 1868, when he was placed upon the retired list.

THAULOW, tou'lôv, FRITS (1847—). A Norwegian landscape painter, born in Christiania. He was a pupil of Sörensen at Copenhagen and of Gude at Karlsruhe. He became known in France by his snow scenes, his night scenes, his moonlights, and his depiction of water. Examples of his work are "A November Day in Normandy" (National Gallery, Berlin), and "A Steamer on the Seine," besides others in the Luxembourg, the Pinakothek, Munich, and the museums of Stockholm and Christiania.

THAU'MATUR'GUS. See GREGORY THAUMATAURGUS, SAINT.

THAÜN, tä'ēn', PHILIPPE DE (fl.c.1100-c.1135). The earliest Anglo-Norman poet whose work has come down to us. Little is known of him. He probably belonged to a family near Caen, France, whence he went to England. He wrote "Li Cumpoz," or "Computus," the so-called "Livre des Créatures," about 1115. It is a poetical treatise in six-syllabled lines on the ecclesiastical calendar. Of its seven manuscripts three are in the British Museum and three in the Vatican. More important is "Li Bestiare," or "Physiologus," which the poet probably composed about ten years later. It was dedicated to Adelaide, Queen of Henry I. But one manuscript has survived, viz., Cotton, Vespasian, E. x. It contains 3194 verses, consists of lines of six and eight syllables, and rhymes in couplets. It is the first French bestiary based on the Latin Physiologus, one of the most noteworthy of the bestiaries (q.v.). Philippe groups his creatures as beasts, birds, and stones, and treats each creature as a symbol. His allegories are in general naïve; those of the dove and the pelican are not without beauty. He is more valuable for his linguistic legacy in connection with the *langue d'oïl* than for his poetic talents, which were in fact poor. Consult: Mall, *Li Cumpoz de Philippe de Thaün* (Strassburg, 1873); and Walberg, *Le bestiaire de Philippe du Thaün* (Lund and Paris, 1900).

THAUSING, tou'sĭng, MORITZ (1838-84). An Austrian art critic, born near Leitmeritz, Bohemia. He studied at Prague, Vienna, and Munich, and in 1868 became curator of the Archduke Albert's collection of drawings and engravings (*Albertina*, Vienna). In 1873 he was called to the University of Vienna as professor of art history. His publications include: *Dürers Briefe, Tagebücher und Reime* (1872); *Dürer: Geschichte seines Lebens und seiner Kunst* (2d ed. 1884).

THAX'TER, CELIA [LAIGHTON] (1836-94). An American poet, born at Portsmouth, N. H. Her father was keeper of the United States Government lighthouse on the Isles of Shoals, where her girlhood and much of her after life were passed. In 1851 she married Levi Lincoln Thaxter, a Browning scholar. Mrs. Thaxter's poetry was reflective of her quiet life on the islands. It expressed with simplicity and delicacy her feeling for the sea and its perils, and also for the gentler aspects of nature. Her works include: *Poems* (1872); *Among the Isles of Shoals* (1873), a series of papers begun in the *Atlantic Monthly* in 1867; *Poems* (1874); *Drift-Weed* (1879); *Poems for Children* (1884); *The Cruise of the Mystery, and Other Poems* (1886); *Idyls and Pastorals* (1886); *The Yule Log* (1889); *An Island Garden* (1894); *Stories and Poems for Children* (1895).—Her son ROLAND (1858—), botanist, born at Newton, Mass., professor at Harvard since 1891, wrote numerous monographs and contributions to scientific periodicals in cryptogamic botany.

THAYER, thâr *or* thā'ẽr, ABBOTT HENDERSON (1849—). An American figure, landscape, and portrait painter, born in Boston, Mass. His chief artistic training was derived at the Ecole des Beaux-Arts in 1875-79, mainly under Gérôme. Until 1891 he painted portraits and occasional landscapes, but afterwards produced mainly ideal figure pieces. As a landscape painter he achieved considerable success, but his chief strength is figure painting, especially in ideal subjects. One of his earliest successful pictures was "Sleep," the subject of which is a beautiful infant. "Crossing the Ferry" is noteworthy as being one of his few pictures containing many figures. Among the pictures for which his family posed are "Mother and Child" and the "Angel," which obtained a bronze medal at the Paris Exposition of 1889, and is perhaps the most widely known of his pictures, excepting the more ambitious "Virgin Enthroned" (1892). Among his later works are "Florence," a fine mural decoration in Bowdoin College, and "Caritas." Thayer was one of the original members of the Society of American Artists, of which he was for two years president, and is perhaps one of the most personal and original painters in American art. His style seems thoroughly his own, and does not bear the slightest impression of the school in which he studied. His preference seems to be for single female figures, which he invests with great dignity and charm of expression, and treats with great breadth of modeling, both in head and drapery, and with a touch and application of pigment peculiarly his own.

THAYER, Arthur Wilder (1857—). An American composer, born in Dedham, Mass. He studied singing under Charles R. Adams, harmony, counterpoint, and instrumentation under George W. Chadwick, and conducting under Karl Zerrahn. After conducting choral societies in Lowell, Salem, Worcester, Providence, and other towns, he was superintendent of music in the public schools of Dedham and Milton. He was afterwards director of music at Eliot Church, Newton, and a member of the Harvard Musical Association. His works are chiefly songs and part-songs, many of which were written for the Apollo Club of Boston. They include "Rosalind's Madrigal," "Bugle Song," "Sea-Greeting," and "The Quiet Moon upon the Clouds."

THAYER, Eli (1819-99). An American educator, inventor, and anti-slavery agitator, born at Mendon, Mass. He graduated at Brown University in 1845, and in 1848 founded Oread Institute. He is chiefly remembered for his connection with the 'Kansas Crusade,' the purpose of which was to secure the admission of Kansas as a free State. With this aim in view he early in 1854 organized the Massachusetts Emigrant Aid Company; soon afterwards affiliated it with the Emigrant Aid Company of New York; and a year later reorganized the two under the name of the New England Emigrant Aid Company. Local leagues were established whose members emigrated to Kansas and settled in localities where the company had erected hotels for their temporary accommodation and had provided saw-mills and other improvements. The company proved a financial failure, but its main purpose was successful. Under its auspices the towns of Lawrence, Topeka, Manhattan, Osawatomie, and other places were settled, and in this way contributed greatly to the saving of Kansas for freedom. (See Kansas.) In 1856 Thayer began a somewhat similar but unsuccessful work in Virginia, and founded the town of Ceredo, containing about 500 inhabitants from New England. From 1857 till 1861 he was a member of the National House of Representatives. He was also an inventor, and he patented, among other things, a hydraulic elevator, a sectional safety steam boiler, and an automatic boiler-cleaner. He published a volume of Congressional speeches (1860), a collection of lectures (1886), and *History of the Kansas Crusade* (1889).

THAYER, James Bradley (1831-1902). An American lawyer and author, born at Haverhill, Mass. He graduated at Harvard in 1852 and at the Harvard Law School in 1856. From that time until 1874 he engaged in the practice of law, and from the latter year until his death he was a professor in the Harvard Law School. His publications include: *Letters of Chauncey Wright* (1877); *A Western Journey with Mr. Emerson* (1884); *The Origin and Scope of the American Doctrine of Constitutional Law* (1893); *The Teaching of English Law in Universities* (1892); *Cases on Evidence* (1892); *Cases on Constitutional Law* (1895); *The Development of Trial by Jury* (1896); *A Preliminary Treatise on Evidence at the Common Law* (1898); and *John Marshall* (1901). Consult: *The Harvard Graduates Magazine*, vol. x. (1901-02); and *The Harvard Law Review* (April, 1902).

THAYER, John Milton (1820—). An American soldier and politician. He was born at Bellingham, Mass., was educated at Brown University, and was admitted to the Massachusetts bar. In 1853 he went West and in the following year settled at Omaha, Neb., which he made his permanent home. In 1855 he was elected major-general of the Territorial forces, and until 1861 conducted the campaigns against the Indians, in 1859 capturing the Pawnees and placing them on a reservation. At the outbreak of the Civil War he became colonel of volunteers and served with distinction till 1865. His bravery at Fort Donelson and Shiloh brought him the appointment as brigadier-general, in which position he assisted Sherman in the siege of Vicksburg. In 1867-71 he was United States Senator from Nebraska, and in 1875-79 Governor of Wyoming Territory. From 1887 to 1893 he was Governor of Nebraska.

THAYER, Joseph Henry (1828-1901). An American biblical scholar, born in Boston. He graduated at Harvard in 1850, and at Andover Theological Seminary in 1857. In 1864 he became associate professor of sacred literature in Andover Theological Seminary, and in 1884 professor of New Testament criticism in Harvard Divinity School. He translated the New Testament grammars of Winer (1869) and of Buttmann (1873), and published *A Greek-English Lexicon of the New Testament* (1886). He was a member of the American New Testament Company of Revisers of the Authorized Version.

THAYER, Sylvanus (1785-1872). An American soldier, known as 'the father of the United States Military Academy.' He was born at Braintree, Mass., graduated at Dartmouth in 1807 and at West Point in 1808, and entered the corps of engineers. During the War of 1812 he served under General. Dearborn as chief engineer of the Northern Army (1812); under General Hampton as aide-de-camp and chief engineer of the Right Division of the Northern Army (1813); and under General Porter at Norfolk, Va., as chief engineer and brigade-major (1814-15). The two following years he spent in Europe studying fortifications and military schools, and observing the operations of the Allies. From 1819 to 1833 he was superintendent of the Military Academy at West Point, and during this time thoroughly reorganized the institution, and made it one of the best of its kind in the world. During the following years he was employed in constructing fortifications and harbor improvements around Boston and as a member of various boards until 1858, when he was granted sick leave. In March, 1863, he was commissioned colonel of engineers and shortly afterwards was brevetted brigadier-general in the Regular Army. On June 1, 1863, he was retired from active service. He gave liberally to the cause of education. He founded a free library and endowed an academy at Braintree, and founded (1867) the Thayer Engineering School at Dartmouth College.

THAYER, Whitney Eugene (1838-99). An American organist and composer, born in Mendon, Mass. He was favorably known, in Europe as well as America, for his musical attainments. He was for a time editor of the *Organist's Journal* and the *Choir Journal*, and served as the conductor of the Boston Choral Union and New England Church Musical Association. In 1881 he came to New York and was until 1888 organist of the Fifth Avenue Presbyterian Church. He was the composer of many organ pieces, part songs, and songs, but his greatest work was the *Festival Cantata* for soli, an 8-part chorus, and orchestra.

THAYER, William Roscoe (1859—). An American author and editor. He graduated at Harvard College in 1881, and was editor of the *Harvard Graduate's Magazine* from its beginning (1892). His verse writing is comprised in *The Confessions of Hermes* (1884); *Hesper, an American Drama* (1888); and *Poems, New and Old* (1894). His most noted historical study is *The Dawn of Italian Independence* (1893), an excellent and useful work. He also wrote *History and Customs of Harvard University* (1898) and *Throne-Makers* (1899), and edited *The Best Elizabethan Plays* (1890).

THE'ÆTE'TUS (Lat., from Gk. Θεαίτητος, *Theaitētos*). An important dialogue of Plato, discussing all the answers to the question: What is knowledge? The speakers are Socrates and the Athenian youth Theætetus.

THE'ATINES. A Roman Catholic religious community, which played, next to the Jesuits, the most important part in the movement for reform from within the Church in the sixteenth century. Its founders were Saint Cajetan (Gaetano da Tiene) and Giovanni Pietro Caraffa, at that time Bishop of Chieti, from the Latin title of whose see, Theate, the Order took its name. With two other friends, they obtained a brief of Clement VII., dated June 24, 1524, formally constituting the new brotherhood, with the three usual vows, and with the privilege of electing their superior, who was to hold office for three years. They were all to be priests. Their first convent was opened in Rome, and Caraffa was chosen as superior. He was succeeded in 1527 by Cajetan, and the congregation began to extend to the provinces. After a time, however, it was thought advisable to unite it with the somewhat analogous Order of the Somaschians (q.v.); but this union was not of long continuance, Caraffa, who was elected Pope, under the name of Paul IV., having restored the original constitution in 1555. By degrees, the Theatines extended themselves, first over Italy, and afterwards into Spain, Poland, and Germany, especially Bavaria. They did not find an entrance into France till the following century, when a house was founded in Paris under Cardinal Mazarin in 1644. To their activity and zeal Ranke ascribes much of the success of the Counter-Reformation in the south of Europe. At the present time the Order numbers not more than one hundred members.

There is an Order of nuns bearing this name. It was founded in Naples, in 1583, by Ursula Benincasa. It never spread out of Italy and has now only a few nunneries.

THEATRE (OF. *theatre*, Fr. *théâtre*, from Lat. *theatrum*, from Gk. θέατρον, *theatre*, place to view shows or plays, from θεᾶσθαι, *theasthai*, to view, behold, from θέα, *thea*, view, sight). A building used for the presentation of dramatic and similar spectacles.

Ancient Theatre. The theatre as a form of architecture was originated by the Greeks and naturally developed with the drama. At first it was simply the open space near the Temple of Dionysus, where the chorus danced about the altar of the god while the solitary actor, perhaps standing on the steps of the altar, carried on a dialogue with their leader. It is probable that at times the chorus of satyrs actually drew a wagon containing the actor who impersonated the god, and who naturally addressed his companions from this vantage ground, and it is quite possible to see in such a scene the 'car of Thespis,' with which the founder of tragedy is said to have traversed Attica. When tragedy became a State institution at Athens, set places for its performance were naturally provided; one of these was the 'Orchestra' near the Agora, a circular dancing place which was surrounded by raised seats for the spectators. The other theatre was in the precinct of Dionysus Eleuthereus at the eastern end of the southern slope of the Acropolis, afterwards occupied by the stone theatre.

The earliest Athenian theatre was simply a large circular place (ὀρχήστρα, *orchēstra*, from ὀρχέομαι, *orcheomai*, 'dance') about 75 feet in diameter near the temple. On the hill rose the seats for the spectators (θέατρον, *theatron*, in the strict sense), and these were further enlarged by artificial mounds of earth, so as to form rather more than a semicircle. The orchestra was entered by two passages (πάροδοι, *parodoi*) from the sides. The nature of the ground was such that at the rear it was raised some distance above the level of the sacred precinct, thus affording an opportunity for an underground passage, Charon's steps, by which actors could rise from the ground in the centre of the orchestra. There was at first no scenery or background, and some neighboring house was used as dressing-room. In the centre of the orchestra might be an altar or tomb or other structure, probably of no great height. Such simple settings are all that seem required for the earlier plays of Æschylus, such as the *Suppliants*, *Seven Against Thebes*, and *Persians*. Soon, however, an innovation was made. A tent (σκηνή, *skēnē*) was introduced to serve as a dressing-room, and this speedily became a building, apparently erected just outside the circle of the orchestra, and provided with three doors. It might represent a palace or temple or any other building called for by the play; or the front might be covered with a painted scene, as in the *Birds* of Aristophanes. During all this time actors and chorus were on the same level in the orchestra, except that gods and occasionally other characters seem to have appeared on the roof of the *skene*. Our knowledge of this theatre of the fifth century is partly based on the very scanty ruins of the earliest structure, and partly on the internal evidence of the plays themselves, in which there are many passages which imply that actors and chorus are on the same level, and none, with the exception above noted, that clearly imply any raised stage for the actors. In the fourth century, probably, the theatre at Athens was rebuilt in stone, the orchestra being moved farther back into the hill, and reduced to about sixty feet in diameter, stone seats were provided for the spectators, and outside the circle of the orchestra was erected a long stone *skene*, with projecting wings (παρασκήνια, *paraskēnia*). It seems probable that between these wings the scenery was now displayed, but there is no evidence, in the remains, of any raised stage. The old view, still held in modified form by many, is that in the fifth and fourth centuries there was a stage for the actors, probably low, in front of the *skene*, and that when the chorus was discontinued this was replaced by the high platform of the Hellenistic theatre. Somewhat later there was erected, a short distance in front of the *skene*, a low wall (προσκήνιον, *proskēnion*) about twelve feet high, composed of columns, or half-columns, supporting an entablature, and with the intercolumniations filled with wooden panels. There was a door in the centre, with possibly two more near the sides. In front of this structure the *paraskenia* projected but a little. The space between the *skene* and *proskenion* was roofed over, forming a platform, which varies in different theatres, but is from 10 to 12 feet in height and from about 7 to 9 feet in width. It is maintained by some that in the plays of the Hellenistic time the actors appeared on this level, as there was no chorus. On this point the evidence is far from clear, but it seems not improbable that actors in the drama proper occupied the lower level, and that this platform was for gods. In Asia Minor, under the influence of modified conditions, another type was developed by diminishing the height and increasing the width of the stage, reducing the orchestra to less than a semicircle. This operation might be described as sinking a part of the orchestra, for the lowest row of seats is frequently (as at Aspendus) on a level with the stage, and not, as in earlier Greek theatres, at the level of the orchestra. It is to be noted that this is not really a lowering and extension of the *proskenion*, for at the rear of the new stage appears a decorated front of columns or half-columns and cornices, which forms a background to the actor, similar to that formed by the old *proskenion*. There was no curtain in the Greek theatre.

In the *Roman theatre* the plan is very similar in outline, but the details differ widely. The orchestra was only a semicircle, and was used commonly for seats of honor. The other half of the circle was covered by a low stage (*pulpitum*), whose depth was somewhat less than a radius of the orchestra, and its width not over two diameters. In the rear wall were three or five doors, and in the side walls two, replacing the old *paradoi*. A new entrance into the orchestra was provided by an arched passage under the seats at the side. In the Roman theatre there was a curtain which disappeared below the stage when the performance began.

In Greece, outside of Athens, the chief theatres are at Epidaurus, Eretria, Sicyon, Megalopolis, Mantinea, Delphi, Oropus, and Delos. In Asia Minor Greek theatres have been studied at Pergamum, Magnesia on the Mæander, and Priene, while fine examples not fully excavated are at Aspendus, Telmessus, and other sites. In Sicily and Lower Italy the Greek theatres have been altered in Roman times. Fine ruins remain at Taormina, Syracuse, Segesta, Pompeii, and Fiesole.

In Athens plays were performed only in connection with the festivals of Dionysus (see GREEK FESTIVALS), i.e. the Country Dionysia, the Lenæa, and the Greater or City Dionysia. It was at the latter that tragedy developed, and here the great tragedies were first produced. Comedy was at first confined to the Lenæa, but after about B.C. 465 was also part of the Greater Dionysia. At this festival three tragic poets competed, each producing a tetralogy, i.e. three tragedies and a satyr play. One tetralogy seems to have been performed on each of the three days. The three comedians produced only one comedy each, which seems to have followed on each day the group of tragedies. The arrangements were in charge of the Archon Eponymus, who chose the three poets from among those submitting works, and assigned to each a *choregus*, i.e. a wealthy citizen upon whom devolved the expense of the production. The production was a competition between the choruses, and the victorious choregus dedicated a tablet to Dionysus. The poets received a crown of ivy and a sum of money. Only three actors were allowed, and at first it seems to have been usual for the poet to play the leading rôle. Later, acting became a regular profession, and troupes of three actors were organized. After the fifth century B.C., and perhaps earlier, the leading actors also competed for a prize. The profession was not dishonorable, and the actors seem to have been always free citizens, as were the chorus. Women did not appear on the stage, unless possibly as flute-girls. The costume of the tragic actor was a long tunic, with close-fitting sleeves often richly embroidered, and a cloak or mantle, with sometimes a shorter tunic under the cloak. Masks were also worn, and the stature was somewhat increased by padding, a high top to the mask, and thick-soled shoes (*cothurni*), which also served to raise the actor somewhat above the level of the chorus. The dress of the chorus seems to have resembled that of daily life, except of course in such cases as the *Eumenides* of Æschylus, where the Furies produced a great impression by their awe-inspiring appearance. The satyr chorus wore masks reproducing the typical satyr countenance, a goatskin around the loins, and *phalloi*. The comic actors wore tights, apparently often of gay colors, a short tunic and cloak, a phallus, and comic mask; the costume of the chorus varied with its character, and the poets allowed free scope to the imagination, as in the *Birds* and *Clouds* of Aristophanes. In the new comedy the dress was modified and more nearly approached that of daily life, from which the characters were taken. At the same time there was introduced a typical series of masks, so designed that the mask at once indicated the character.

At Rome the drama, like the theatre, was largely borrowed from the Greek, but it was not a state performance by citizens, at least in its developed form. The actors were troupes (*greges*) of freedmen or slaves, and the plays were in general adapted from the Greek, especially in tragedy, though the *prætextæ*, in which the hero wore the *toga prætexta* and not the Greek costume, were an attempt to treat national subjects in the Greek tragic style. In the comedy were distinguished the *palliata*, based on the Greek new comedy in which the Greek cloak (*pallium*) was worn, and the *togata*, treating of native life and character, and appropriately costumed. The plays were produced at public games, and also at the games or shows given on special occasions by private individuals. The magistrate or giver of the games paid the leader of a troupe (*dominus gregis*), who owned plays and produced them. The theatre thus never entered into or reproduced the national life in Rome as in Greece, and in later times the favorite Roman shows were the *Mimes* and *Attellanæ*, both of which seem to have been marked by buffoonery and indecency.

MEDIÆVAL AND MODERN. During the Middle Ages theatrical performances consisted almost wholly of religious or semi-religious allegories, known as Mysteries and Miracle Plays, which were given in churches, convents, or castle halls and without any elaborate staging. When performed out of doors at fairs, a rude booth of boards sufficed. No seats were provided for the spectators. In 1548 the Paris Confraternity of the Trinity built a theatre which was licensed to perform "profane pieces of a lawful and honest character." There were no seats or scenery. Until the end of the sixteenth century theatrical performances were given in England by bands of strolling players who had no permanent theatres, but performed chiefly at fairs and in the courtyards of inns, the most honored guests watching the performance from the second or third story windows and balconies, an arrangement that may have suggested the different tiers of balconies in the modern theatre. The first permanent playhouse in London was the theatre built by James Burbage about 1576. The Globe Theatre, built in 1598, also by Burbage, in which Shakespeare's plays were produced, was an hexagonal wooden structure partly open at the top. In the central court, or pit, the people stood, while the gentry sat in galleries running around three sides of the building, and a number of wits and gallants sat upon the stage, which was concealed between the acts by a curtain running upon an iron rod. Shakespeare had no scenery beyond hangings and curtains, a placard inscribed "This is a Forest," or "This is a Prison," sufficing. Movable scenery first made its appearance about 1650. Performances were given in the afternoon, except upon special occasions, when candles were used and kept snuffed by men who were duly applauded for their dexterity in keeping the lights properly trimmed. The first French theatres were modeled after those of Italy, where theatres were built about 1680 in Florence and Vicenza. The first ballets performed under Louis XIV. were organized by Italians, who introduced movable scenery, footlights, and sidelights. For Italian ballets introduced into France in 1680, scenery painted in proper perspective was first used, and women were admitted among the dancers, the female parts having been taken before that by boys. In 1759 the chief Paris theatres abolished the privilege of the gallants to sit upon the stage, and the London theatres followed their example. In Paris the custom had been so abused that the actors in popular plays had no room; in a play by Favart at the Théâtre Français in 1740, such was the crowd that there was only room on the stage for one actor to appear at a time. About 1660 women first appeared upon the English stage, where their parts had until then been played by boys or young men. In 1700 scenery began to be painted upon different flats running upon grooves in the stage, France leading the way in stage decoration, with such famous artists as Watteau and Boucher as scene painters. During the nineteenth century the pit, which formerly contained no seats and was used by the common people and by lackeys waiting for their masters, changed its name and character. Both in Europe and America the former pit, now known as the orchestra, is filled with seats which are, with a few exceptions, the most expensive in the theatre, while the cheapest places are now in the top galleries.

According to Dunlap the first American theatre was built in Williamsburg, Va., in 1752 by the English actor William Hallam, who brought a company from England and was for years the chief spirit in theatrical enterprises in the New World. The first play produced was *The Merchant of Venice*. About the same time a brick theatre, with seats for about 600 persons, is said to have been built in Annapolis. The first New York theatre was opened by Hallam in September, 1753, in Nassau Street, upon the site of an old Dutch church. Plays were given three times a week. At the end of the season Hallam moved to Philadelphia, where in April, 1754, he fitted up a building near Pine Street and gave dramatic performances. An actor named Douglass built a theatre in 1754 near Old Slip, in New York, which he called the Histrionic Academy, opening with *Jane Shore*, and five years later he was also the proprietor of a Philadelphia house. In 1759 Newport had its theatre and in the following year one was built in Perth Amboy, then the capital of the Province of New Jersey; the same company played engagements in New York, Philadelphia, Newport, and Perth Amboy. In 1757 another theatre was built in John Street, New York. In 1773 Charleston and Boston had their own theatres, and by the end of the century there were others in Albany, Baltimore, and Richmond.

The modern theatre consists, roughly speaking, of two parts, the auditorium and the stage. The first consists of suitable entrances, lobbies, reception rooms, staircases, and means of approach to the auditorium proper, which is commonly of semicircular or horseshoe form, the floor sloping down to the stage. According to the size of the house there are from one to four balconies, which follow the curve of the horseshoe; in some of the opera houses one or two of these balconies are divided into boxes, each containing four or more seats. The stage, which in houses intended for opera or spectacular pieces is as large as the auditorium, consists of the stage proper, a floor with an upward incline from the footlights to the rear wall of the theatre of about half an inch to the foot; and on either side of the stage and at the rear, there are spaces for the proper manipulation of scenery and for dressing-rooms. Above the stage are the flies, where hang the pieces of scenery to be lowered into place by ropes, and below it corresponding depths into which the scenery may be dropped. Gas, which replaced candles for lighting purposes in Europe in 1823 and in this country about 1830, has within the last few years given place to electric lights, making possible better effects of lighting, and doing away with much heat and foul air. One or two men now control from a table at the side of the stage the whole lighting of the house, raising or lowering the lights in any part of it at will. Lights are used upon the stage as footlights, in the flies at the top, and in the wings at the side. Calcium lights are used where great brilliancy is desired. Scene-painters and stage carpenters now succeed in doing with ease what would have been considered impossibilities fifty years ago. Moving scenery running upon vertical rollers at either side of the stage makes possible the illusion of horse-racing, while chariot races, railroad trains, and steamboats in motion are represented with much skill. The effect of lightning is produced by burning lycopodium powder or by electric sparks; the sound of wind by a metal cylinder revolving against a piece of cloth or wood, the sound of rain by shaking peas in a pan, of thunder by the rolling of cannon balls, of church chimes by bars of steel, and the illusion of snow by small pieces of paper dropped through coarse sieves. The magic lantern is also successfully used. In the theatre which Richard Wagner built at Bayreuth it is used to portray cloud effects, the ride of the Valkyrs who fly through the air, etc. At the Dresden Opera House, long famous for its scenic devices, the remarkable use of the magic lantern was first made in *The Rat Catcher of Hameln* to simulate the army of rats that came at the call of the Pied Piper and drowned themselves in the river Weser. Steam clouds were first used at Bayreuth to hide the stage from the spectators while the scenery was changed so as not to interrupt the poem by dropping the curtain. Wagner also used curtains of gauze with similar effects. The stage itself is now made in movable sections, which allow scenery to be raised from below as well as lowered from above. Twenty years ago a double stage was constructed at the Madison Square Theatre, New York, a small house with insufficient stage room for the manipulation of scenery; while the performance is going on upon one stage, the scene-shifters and decorators may work upon the other, which when the curtains falls is lowered or raised into place for the next act. Another innovation first tried at this house was to place the musicians above the proscenium arch instead of in front of the footlights; the object was to save space for seats. As a protection against fire spreading from stage to auditorium or vice versa, an asbestos curtain or one of sheet iron in sections is now used in many theatres.

The prices for theatre seats in England in Shakespeare's time varied from one penny to one shilling. In the early American theatres the prices were high—from three shillings for gallery seats to six shillings for seats in the boxes. Prices fell after the Revolution to 25 cents for gallery seats and $1 for box seats. This remained about the scale of prices until after the Civil War, when there was a steady increase. In 1870 first-class theatres in New York charged $1.50 for orchestra seats and from 35 cents to 50 cents for the top gallery. About 1886 a few New York theatres began charging $2 for the best seats in the orchestra and the first row in the first balcony, and gradually all first-class theatres made $2 the price of orchestra seats, with $1.50 and $1 for the balconies, and 50 cents for the gallery. For operatic performances $2 and $2.50 were the prices for orchestra seats in the New York Academy of Music until 1878, when the price was advanced by the English manager, Mapleson, to $3. A few years later, with the advent of Madame Patti, the price rose to $5 for orchestra seats, at which it has since remained. In other large cities such as Boston, Philadelphia, and Chicago, the prices for theatre and operatic performances are about one-third less. In London the best theatres charge $2.50 for good seats, and in Paris the price is but little less. In Germany, with the exception of Berlin, the price of the best seats for either opera or drama seldom exceeds $1.50.

Although the Paris Grand Opéra, built in 1866-72 from the designs of Charles Garnier, at a cost of about $4,000,000, is the most luxurious theatre in the world, the chief opera houses in Munich, Dresden, and Vienna are quite as perfect in their way and superior to the Paris house acoustically. The Metropolitan Opera House of New York is the only American theatre that corresponds with those mentioned in size and appointments. The famous Bayreuth Opera House, built by Richard Wagner in 1876 for the first performance of his Nibelungen trilogy, contained many novelties, of which the chief was an orchestra-pit so depressed below the level of the auditorium as to render the musicians invisible to the audience. The new Prince Regent Theatre at Munich, built in 1902, and devoted chiefly to Wagnerian performances, far surpasses the Bayreuth house in most respects, and is now considered the model opera house of Europe. In France and Germany the State subsidizes its chief theatres. In Paris four theatres—the Grand Opéra, the Opéra Comique, the Théâtre Français, and the Odéon—are allowed a yearly subsidy, in return for which they agree to produce a certain number of new works by native authors and composers and to give a certain number of free performances. In Berlin, Dresden, Munich, and Vienna the chief opera house and the chief theatre are under control of the State. The actors, singers, musicians, and other employees are entitled to pensions.

Law of Theatres. For legal purposes, a theatre is a house or building adapted and used for the purpose of dramatic performances. The courts differ in the various States as to what may be considered a dramatic performance, but generally almost any exhibition on the stage is included in this term. Thus, negro minstrel shows and 'comic operas' have been held to be theatrical performances within a law governing theatres. Laws regulating theatres are a constitutional exercise of the police power. Because of the necessity for such regulation, in some States theatres are considered as enterprises of such a public character that they come within the State laws prohibiting the discrimination against persons because of race or color, thus making their obligations in this particular similar to that of hotels and common carriers. However, by the weight of authority a theatre ticket is always a revocable license as to any person, and probably even in the States prohibiting such discrimination, theatrical managers could refuse to sell a ticket, or refuse to admit a person with a ticket without assigning any reason, and thus evade the statutes. Where proper notice is given to purchasers of tickets, the management may make it a condition that tickets shall not be transferable. This may be done by printing such conditions on the back of the tickets themselves and by notices posted at the theatre, or by giving actual notice to purhasers. Under such circumstances theatrical managers may refuse to honor tickets bought from speculators. The spectators may applaud or hiss the players in moderation, but must do so to express their spontaneous emotions, and not come with the intention of stopping or interfering with the performance, as in the latter case they may be ordered to leave the theatre and be forcibly removed if they refuse.

BIBLIOGRAPHY. ANCIENT THEATRE. The best general account in English, except on the stage question, is Haigh, *The Attic Theatre* (2d ed., Oxford, 1898); a good brief statement is Barnett, *The Greek Drama* (London, 1900). The standard work on the construction of the theatre is Dörpfeld and Reisch, *Das griechische Theater* (Athens, 1896). Other good works are: A. Müller, "Die griechischen Bühnenaltertümer," in Hermann's *Handbuch der griechischen Antiquitäten* (Freiburg, 1886); Bethe, *Prolegomena zur Geschichte der Theaters im Altertum* (Leipzig, 1896); Puchstein, *Die griechische Bühne* (Berlin, 1901). See also Frazer's *Pausanias*, vols. ii. and v. (London, 1898), against Dörpfeld; and in the voluminous periodical literature, Capps, *The Greek Stage According to the Extant Dramas, Transactions of American Philological Association*, vol. xxii. (Boston, 1891); Pickard, *The Relative Position of the Actors and Chorus in the Greek Theatre of the Fifth Century B.C.*, in *American Journal of Philology*, xiv. (Baltimore, 1893).

MEDIÆVAL AND MODERN. Dunlap, *History of the American Theatre and Anecdotes of the Principal Actors* (New York, 1832), the best account of the early American theatres; Malone, *History of the Stage* (London, 1821), an exhaustive account of the English stage to the beginning of the nineteenth century; Pougin, *Dictionnaire historique et pittoresque du théâtre* (Paris, 1885), a full history of French theatres; Garnier, *Le nouvel opéra de Paris* (ib., 1876), an elaborate treatise on opera houses, by the architect of the Paris Opéra; and Ordish, a series of excellent articles on early London theatres published in *The Antiquary* (1885-86). For the theatre in its legal aspects, consult: Wandell, *Law of the Theatre* (Rochester, 1892).

THÉÂTRE DES ITALIENS, tȧ'ä'tr' dȧ zė'tȧ'lyăN' (Fr., theatre of the Italians). A former theatre of Paris from which the Boulevard des Italiens derives its name.

THÉÂTRE FRANÇAIS, frăN'sȧ'. The French national theatre. See COMÉDIE FRANÇAISE.

THÉÂTRE LIBRE, lĕ'br' (Fr., free theatre). The name of a dramatic enterprise founded in 1887 by André Antoine, then a young Parisian clerk. With some fellow amateurs of the Gaulois Club he arranged the production (March 30, 1887) of four new one-act plays at the Elysée des Beaux-Arts at Montmartre, and in the course of the year formed the association of the Théâtre Libre, to be conducted upon the following principles: the season to consist of eight different representations, one each month from October to June; no tickets to be sold to the public; the enterprise to be supported by subscribers who with invited guests should form the only audience. The design was to give young authors a chance to try their strength; and also, for art's sake, to produce plays which for any reason, political or moral, might be forbidden by the censorship if undertaken at a public theatre. In an artistic way the Théâtre Libre won success, though it excited much debate from the first. Its founder aimed to do away with all conventionality and to attain a degree of realism often thought out of the question upon the stage. In its first eight years, about 150 writers contributed works for its performances, and a considerable proportion of these previously unknown pieces were afterwards accepted and brought out by other theatres. At the same time such famous writers as Zola, the Goncourts, Mendès, Bergerat, Ibsen, and Tolstoy also found presentation here. Financially, however, M. Antoine found his difficulties accumulating, and in 1894 he accepted a position as an actor at the Gymnase Theatre. For a short time he was a director of the Odéon (1896); then he resumed the direction of the Théâtre Libre, for several years located in the Salle des Menus-Plaisirs and known since 1897 as the Théâtre Antoine. To this the general public is admitted in the usual way, though subscribers still retain their special privilege at eight representations a year. The idea of the Théâtre Libre has been copied in the Freie Bühne of Berlin, and in similar more or less ephemeral institutions in London and other cities.

THEATRUM EUROPÆUM (Lat., survey of Europe). A chronicle of events which appeared in volumes at Frankfort-on-the-Main between 1616 and 1718. During one portion of its existence it was illustrated with copper-plate engravings. In all 21 volumes were issued. The work was in part the forerunner of political journals.

THEBAÏS, thĕ'bȧ-ĭs *or* thē-bā'ĭs (Lat., from Gk. Θηβαίς). (1) The territory of Thebes, in Egypt. In later times the name was applied by the ancients to Upper Egypt. (2) An ancient Greek epic giving in 7000 verses the story of the house of Labdacus, and the attack of the seven chieftains on Thebes. (3) A dull and long-drawn work by P. Papinius Statius, dedicated to Domitian. It contains in 12 books the story of the contests of Eteocles and Polynices.

THEBAN CYCLE. The name given to a series of ancient Greek epics treating the legends of Thebes. It includes the *Thebaïs* (q.v.); the *Epigoni*, a poem of about 7000 lines, telling of the capture of the city by the descendants of the heroes of the *Thebaïs;* and the *Œdipodeia*, attributed to Cinæthon, a Lacedæmonian, containing about 6000 lines and giving the story of Œdipus.

THEBES, thēbz (Lat. *Thebæ*, from Gk. Θῆβαι). A celebrated city of ancient Egypt, situated on both sides of the Nile in about latitude 25° 50′ N. Its old Egyptian name was *Wĕset*, but in later times it was also called *Nu*(*t*) *Amen*, 'the city of Ammon,' *Nu*(*t*) *'o*, 'the great city,' or simply *Nu*(*t*), 'the city' (*urbs*); in the Old Testament it is called *No* or *No Amon*, and in the Assyrian inscriptions its name appears as *Nî'*. By the Greeks, who identified the god Ammon with Zeus, it was sometimes called 'Diospolis, 'the city of Zeus,' and it was specially designated as 'Great Diospolis' to distinguish it from 'Lesser Diospolis,' the modern Hon. The origin of the more usual Greek name Θῆβαι is obscure. Thebes was the capital of the fourth nome of Upper Egypt, and was a very ancient city, but did not rise to importance until the time of the Eleventh Dynasty, which was of Theban origin. Under this and the following dynasty the city was the capital of Egypt, and some of its oldest temple buildings date from this period.

Its real greatness, however, begins with the expulsion of the Hyksos invaders by the Theban princes, who united the whole land under their sway (Eighteenth Dynasty), and adorned their city with temples and palaces of unprecedented magnificence. The kings of the Nineteenth and Twentieth Dynasties added to the work of their predecessors, and for centuries Thebes was the chief residence of the Egyptian Pharaohs and far surpassed all other cities of the land in wealth and splendor. The persecution of the worship of Ammon by the heretic King Amenophis IV. (q.v.), and the temporary removal of the seat of government to Tel el-Amarna, affected Thebes but little. Seti I. and especially Rameses II. (c.1340-1273 B.C.) restored the desecrated sanctuaries and lavished enormous wealth upon the Theban temples. Under the Twenty-first Dynasty, however, Thebes ceased to be the capital of Egypt, and from this time gradually declined in importance. In the seventh century B.C. it was again the seat of government, for a time, under the Twenty-fifth or Ethiopian Dynasty, but when the capital was removed to Sais (q.v.) by the following dynasty (Twenty-sixth), it began a new period of decline. Its temples were repaired and new buildings were erected by later monarchs, especially by the Ptolemies, but, overshadowed by the rise of new cities, it gradually sank to the position of an insignificant provincial town. Its great temples sustained serious injuries in the course of various revolts against the Ptolemies, and were further ruined by an earthquake in B.C. 27. In the time of the geographer Strabo (B.C. 24) Thebes was a ruined city as at present, its site being occupied merely by a few scattered villages.

The city proper lay upon the east bank of the river between the great temples now represented by the ruins of Luxor (q.v.) and Karnak (q.v.); a little to the north was the suburb Ma'du, the modern Medamut, with a temple built by Amenophis II. (Eighteenth Dynasty) and dedicated to the Theban war god Mont (q.v.). Additions were made to this temple by Seti I., Rameses II., and several of the Ptolemies, but it is now almost entirely destroyed. On the west side of the river were suburbs of considerable size, and Rameses III. seems to have built his palace in the neighborhood of his memorial temple at Medinet Habu (q.v.), but in general this side of the river was occupied by the Theban necropolis, which extended to the Libyan range. It contained numerous temples, erected as memorials of the Egyptian kings, and to these temples were attached dwellings for the priests, schools, granaries, stables, barracks, and other buildings. Nearer the hills were the dwellings of the artisans whose employment was in the necropolis: stone-masons, builders, painters, sculptors, and especially the embalmers. There were also inns for the entertainment of visitors, and many shops for the sale of funeral offerings and other objects. The necropolis, in fact, formed a great city, and under the New Empire was under the direction of a high official entitled the 'Prince of the Western City.' The principal memorial temples of the Theban necropolis, beginning at the north, were those of Kurnah (q.v.) and Deir el-Bahri (q.v.), the Ramesseum (q.v.), and that of Medinet Habu (q.v.). The Temple of Deir el-Medineh, dedicated to the goddess Hathor, lies a little to the west of the Medinet Habu. It was founded by Ptolemy IV. Philopator, was completed under Ptolemy Philometor and Ptolemy Euergetes II., and in Christian times was converted into a monastery. Between the line of memorial temples and the hills are the cemeteries of Drah Abu'l Negga, Asasif, Abd el-Kurnah, and Kurnet Murraī. The rocky hills bordering on the plain of the necropolis are honeycombed with tombs. In a narrow valley to the north of Kurnah are the tombs of the kings, in which were buried the monarchs of dynasties XVIII–XX. Each of these tombs contains a number of galleries and chambers whose walls are covered with paintings and religious texts. Strabo states that forty of these tombs were worthy of special attention; twenty-five of these are now accessible. The tombs of the queens, to the west of Medinet Habu, are for the most part in an unfinished state. A few of them, however, dating from the Eighteenth Dynasty, are elaborately constructed and are richly adorned with sculptures and paintings. Near Kom el-Hetan, between Medinet Habu and the Ramesseum, are two colossal statues of King Amenophis III.; they originally stood before a temple erected by the King, but only traces of the building now remain. The more northerly of these colossi, the famous 'vocal Memnon' (see MEMNON), was in no way distinguished from other colossi. The chief deities worshiped at Thebes were the great god Ammon (q.v.), his spouse Mût (q.v.), and their child Chons (q.v.). See LUXOR and KARNAK.

Consult: *Description de l'Egypte* (Paris, 1809-29); Lepsius, *Denkmäler* (Berlin, 1849-58); Wilkinson, *Topography of Thebes* (London, 1835); Mariette, *Monuments of Upper Egypt* (ib., 1877): Wiedemann, *Geschichte des alten Aegyptens* (Berlin, 1878).

THEBES (Gk. Θῆβαι, *Thebai*). The principal city of Bœotia, in ancient Greece, situated in the southeastern part of the country, on the northern slope of a ridge which separates the valley of the Asopus from the plain to the north. The Acropolis or Cadmea, now occupied by the little town of Thiva or Phiva, lay on the high ground between the Ismenus and Dirce. At its greatest extent the ancient city seems to have extended beyond both streams. According to legend, Cadmus (q.v.) was the founder of the city—hence Cadmea as the name of the Acropolis. The city played a prominent part in the stories of the heroic age, the series of epics (see THEBAN CYCLE) vying in interest with those which gathered about Troy. For these stories, see ŒDIPUS; ANTIGONE; ETEOCLES AND POLYNICES; CREON; AMPHION; DIRCE. After the Bœotian invasion Thebes seems gradually to have secured the leading place in the Bœotian league, reducing finally the rival city of Orchomenus. Tradition told of the code of laws drawn up for the city in the eighth century B.C. by the Corinthian Philolaus. It is not till near the end of the sixth century B.C. that we reach a purely historical period—the earliest well-attested event being the dispute between Thebes and Platæa, which resulted in the latter placing itself under Athenian protection, and the former becoming involved in an unsuccessful war. During the Persian invasion under Xerxes Thebes sided with the invaders, and fought against the confederated Greeks at Platæa B.C. 479. This conduct greatly weakened for a time the prestige of Thebes, and almost cost her the headship of the Bœotian league. After the battle of Coronea (B.C. 447), however, the tendency to revolt was checked, and from this time Thebes was almost continuously the recognized leader in Bœotia. When the Peloponnesian war broke out, Thebes took part with Sparta, and at its close was eager for the destruction of Athens. But the policy of victorious Sparta soon aroused distrust, and Thebes gave a friendly welcome and shelter to those Athenians whom the oppression of the Thirty Tyrants (q.v.) compelled to abandon their city. It was from Thebes that Thrasybulus and his band started on their famous expedition for the deliverance of Athens, accompanied by a body of Theban citizens. During the following years the Thebans completely changed their policy toward Sparta, and in the Corinthian War were among the bitterest enemies of their old ally. The Peace of Antalcidas (B.C. 387), as interpreted by Sparta, broke up the Bœotian league, and led to new disputes, culminating in the treacherous seizure of the Cadmea by the Spartans (B.C. 382). The expulsion of this garrison by Pelopidas and his associates (B.C. 379) led to renewed hostilities, which culminated in the battle of Leuctra (B.C. 371), where Epaminondas (q.v.) crushed the power of Sparta outside the Peloponnesus. Before his death at Mantinea in B.C. 362, Epaminondas had secured for Thebes the supremacy in Greece, though Athens was estranged and even openly hostile. Thebes did not long hold the position thus gained. The quarrel with Athens prevented any union against the growing power of Macedon, until the seizure of Elatea (B.C. 338) furnished an opportunity for Demosthenes to secure by his eloquence a union for which he had long striven. The effort came too late, and in the same year the battle of Chæronea crushed the liberties of Greece.

After Philip's death the Thebans made a fierce but unsuccessful effort to regain their freedom. Their city was taken by Alexander, who leveled it to the ground, sparing, it is said, only the house of the poet Pindar, and sold the entire surviving population into slavery (B.C. 335). For twenty years it remained in utter desolation, but in B.C. 315 it was rebuilt by Cassander, who gathered into it all the Thebans he could find in Greece. It now had a circuit of about five miles, and seems to have prospered. It suffered at the hands of Mummius (B.C. 146) and was severely punished by Sulla for siding with Mithridates. After this it steadily declined, and Pausanias found only the Cadmea inhabited, and the lower city in ruins. It revived under the later Roman Empire, as it was a safer residence than the exposed coast cities. During the eleventh and twelfth centuries it was the seat of a considerable population engaged in the manufacture of silk, and yielded a rich booty to Norman plunderers in A.D. 1146. Under the Turks it again declined, and even now is only a country town with a population of about 3500. The course of the town walls can be traced in some places, and deep digging has brought to light some remains, but in general there are but few vestiges of the ancient city left. Consult Fabricius, *Theben* (Freiburg, 1890).

THÉDENAT, tā'de-nä', HENRI (1844—). A French archæologist, born in Paris. He studied in the Ecole Pratique des Hautes-Etudes at the Sorbonne, devoting himself especially to epigraphy. His publications, in collaboration with Héron de Villefosse, include *Les cachets d'oculistes romains* (1882) and *Inscriptions romaines de Fréjus* (1885). He also wrote *Le Forum romain et les Forums impérieux* (1898), and *Une carrière universitaire, Jean-Félix Nourrisson* (1901).

THEFT. See LARCENY.

THEINE. See CAFFEINE.

THEINER, tī'nẽr, AUGUSTIN (1804-74). A German Roman Catholic historian and canonist. He was born at Breslau and educated there and at Halle, where he took his degree as doctor of law in 1829. His intercourse in Paris with Lamennais (q.v.) seems to have disturbed his religious views, but he was reconciled with the Church at Rome in 1833, and became a teacher in the College of the Propaganda. After his ordination to the priesthood, he entered the Congregation of the Oratory, and published several historical and critical works. In 1850 he was placed in charge of the Vatican archives. In 1870 he was removed from the position of archivist, apparently in consequence of the charge that he had supplied documents with which to combat the theory of the infallibility of the Pope. His most important work was the new edition of the *Annals* of Baronius and his continuators, with three supplementary volumes. Important also are the collections of documents on the ecclesiastical history of various countries and of the Council of Trent. In his *Geschichte des Pontificates Clemens XIV.* (1853), he attacked the Jesuits and roused fresh suspicions of his loyalty to the Church, which were confirmed by his *Histoire des deux concordats de la république* *française en 1801 et 1803* (1868), and by his friendly intercourse with the German Old Catholic leaders. He died of apoplexy at Cività Vecchia. Consult Brück, *Geschichte der katholischen Kirche in Deutschland* (Mainz, 1896).

THEISM (from Gk. *θεός*, *theos*, god). The theory which assumes a living relation between God and His creatures, though it does not necessarily define it. It also carries with it, in many theories, the personal implication, and explains the universe in terms of divine reason and will. The intellectual genealogy of this conception, in its historical aspect, is very ancient, dating back to the early thought of the Greeks. In the philosophic theism of Socrates, which was a reply to the irreligion of the Sophists, we find a clear conception of a Divine Personality and an attempt to prove its existence. Socrates makes use of the doctrine of final causes for this purpose, maintaining, against the Sophistic materialism, that the universe is the product of benevolent moral will (*Phædo*, 96, 199); that this will holds personal relations with all his creatures, and seeks to bring the highest good to all. This he taught while practically all the East worshiped the objects of nature (sun, trees, etc.) as God, and, therefore, Socrates may be regarded as the founder of theism as understood in the West. Plato added little to the fundamental conception except to develop it by means of his doctrine of the Idea (*ἰδέα*, *εἶδος*). The absolute Idea is the Good, i.e. God. In the *Republic* (509 b.) we accordingly read: "All intelligible beings derive their being and their essence from the good." To this thesis he adduces four proofs, all bearing on Socrates's idea of final cause. (1) From the notion of efficient cause. All things proceed from some cause, and the cause must be adequate to produce what exists. (*Sophist*, 205 b.) (2) From the ideal nature of the Cause. If there be a universe of real things, as no one can doubt, it can proceed only from an ideally perfect cause, i.e. from God. (*Philebus*, 30.) (3) From the idea of cause as motion. All motion implies a self-mover, i.e. an adequate originating cause for the motion and change. (*Laws*, x.) (4) From the finality of cause. All things seek their end. The end must be moral, and therefore transcendent. In other words, the universe must at last prove itself to be a revelation of the Good, i.e. God. This is the heart of the Platonic theism. "Let me tell you, then, why the Creator made this world of generation. He was good, and the good can never have any jealousy of anything. And being free from jealousy, He desired that all things should be as like Himself as they could be." (*Tim.* 29.)

Aristotle's argument is the same as Plato's, but deeper in its empirical developments. He rises, synthetically, through nature, to his proof of the divine existence. In the eighth book of his *Physics* he gives us what he calls his 'proof of the First-Mover.' Everything that is in motion is moved either by something else or by itself. If the former be the case, we are obliged to follow up the series of causes until we arrive at the idea of a self-mover, i.e. an immovable cause having its end in itself. Hence the first-mover must have been set in motion by itself, i.e. it is a self-mover. But, inasmuch as, commonly speaking, it is essential to the idea of motion that there be something to be moved, it follows that there may be three kinds of movers: first, the mover that imparts motion and is moved; second, the mover that is movable in itself but immovable in relation to others; and third, the mover that is immovable both in itself and in relation to others. It is the last kind alone that gives us the speculative foundation of theism; for this is the mover that moves the rest of the world and is nevertheless absolutely immovable by anything external to itself; a true cause of the origin and end of all things.

Augustine, the most eminent of the early Christian thinkers, adopted the Platonic theism, seeking to combine it with the Christian views. He accepted substantially all the principal proofs of God's existence and His providential government as these had been prepared in Greek thought; but there were points where he added to previous thinking. The Greeks had put a gulf between God and the world, so great that the tendency was to separate them absolutely. Augustine completed this by declaring that God made the world out of nothing, and without the aid of intermediate agents. Second, Augustine taught that God creates out of His mere goodness and bounty, not because He has need of anything; so that in creating He adds nothing to His nature. (*Conf.* xiii. iv.) This view struck at the Stoic pantheism, at the Oriental theories of emanation, and at the fundamental weakness of the platonic theism, the failure to define the nature of the relation between God and the finite world.

The various other proofs of the existence of God given in the Middle Ages pursue two methods, one *a priori*, the other *a posteriori*. That is, one starts in Platonic fashion with the idea of a perfect being and infers its existence from this idea; the other argues, after Aristotle, from the evidences of order and perfection in the world to the idea of a perfect being who is the author of them. Anselm is an early and prominent representative of both this and the *a priori* or ontological argument, which assumes that God is a being of such a nature that it is impossible to conceive any greater. The defect of this argument, as Gaunilo pointed out, consists in arguing from existence in thought to existence in fact. From the former, of course, we can logically infer nothing but an ideal thought-existence.

Other theistic proofs during the Middle Ages were concerned with the course of nature and history. Thus Duns Scotus declared that the impossibility of conceiving an infinite chain of natural causes necessarily carried the mind to the idea of a great First Cause adequate to the production and preservation of the world. Aquinas also (*Summa* I., qu. 2) reaches the same conclusion, *a contingentia mundi*, reproducing Aristotle's proofs almost word for word. The contemplation of final causes, though not extensively meditated upon, led to very similar logical results from the cosmological point of view; for mediæval thinkers were fond of dwelling on the fact of the imperfection of the physical and of inferring therefrom the existence of a perfect being in whose spiritual essence the soul could find the ground of the Christian faith. Thus we find that theism received the stamp of Christian ideas; that the greatest minds in the mediæval period gave it their support because they found in it the ground of the harmony of speculative reason and piety.

In modern times philosophical meanings have largely supplanted the theological. Thus Descartes, the most important modern thinker on this subject, developed his theism only after sweeping aside all presuppositions derived from a supernatural source or from the symbols of the Church. Starting with the bare fact of thought (*cogito, ergo sum*), he argues that there must be an adequate cause for the thought of God in the mind. By this thought Descartes says that he means "a substance infinite, eternal, immutable, independent, all-knowing, all-powerful; by which I myself and every other thing have been produced." (*Med.* iii.) Now this thought cannot be a mere negation; for it has reality. Nor can it have arisen by adding many ideas together; for it is simple. Could it have arisen as a result of my growing intelligence? No; because the idea does not admit of growth: God is infinite always and does not admit of more or less. Hence the idea must have a divine origin. A second proof may be stated thus. We need this idea in order to explain to us the immediate existence and continuance of the universe. God is not only needed as a Creator, or logical Prius of the universe, but much more as a Preserver. A merely primary creative cause might be lost in the infinite complex of secondary causes, as in pantheism or deism, but the immediate dependence and continuance of the universe involves the idea of a preserving and sustaining cause, not only that of an originating one. A true cause must, therefore, be adequate to the task of continuing the universe from moment to moment. The existence *now* of a universe involves the self-existence of its absolute Cause. As a third proof Descartes revived Anselm's so-called ontological argument, i.e. the argument from the idea of a most perfect being to its existence. Reality, in his view, is as much a part of the idea of a perfect being, as the angles of a triangle are of the essence of our idea of a triangle, or the perfume of a rose of our idea of a rose.

Kant, in the third part of his *Dialectic*, criticises this argument of Descartes. He does not, indeed, deny the fact that we have the *idea* of a perfect being, but he doubts if *from the idea* we have any right to infer its real existence, since it is possible for us to have an idea (for example, of a centaur) that does not correspond to any object. And inasmuch as all possible proofs of the existence of God are reducible to this one, the ontological, Kant considers that all the arguments of Descartes and of the mediæval thinkers failed to establish their point. Accordingly he proposed a new and infallible proof, the so-called practical or moral arguments for the existence of God, which is as follows. We have the notion of a moral law; conscience responds to the categorical moral imperative. Universal experience proves that happiness and virtue involve each other and cannot be separated. Obedience to these moral conditions is the law of life, of conduct, and character; for the wicked are never, in the long run, happy. Now, said Kant, for this conviction there is needed a cause, supreme and infinite; a cause capable of clinching this relation between happiness and virtue to all eternity; a cause which will secure the triumph of justice as against the moral inequalities of the present life. This moral cause we call, by faith, God. Thus the only ground for insisting on 'proofs' of the existence of this cause is for Kant the subjective need of a cause of the moral law within our souls, and further than this Kant held it was impossible for the human mind to go.

Hegel disagreed with Kant's conclusions, and sought to revive the ontological argument of Anselm and Descartes, in a new form, contending that the idea of a perfect being was an expression of the nature of all thought and all reality. He refused to believe that the traditional separation of thought and thing, upon which Kant depended, represented any real or valuable distinction. For him thought and reality are the same. We cannot ever get 'beyond' thought. To put a barrier, as Kant did, between thought and thing is, for Hegel, to cease to think. All recent reflection on the theistic problem rests on this idealistic presupposition of Hegel. He may, therefore, be regarded as furnishing present-day theism with its most valuable logical foundation.

Consult: Harris, *The Philosophical Basis of Theism* (New York, 1883); Flint, *Theism* (Edinburgh, 1887); Ladd, *The Doctrine of Sacred Scripture* (New York, 1884); Bowne, *Theism* (ib., 1903); Fisher, *Grounds of Theistic and Christian Belief* (ib., 1883; new ed., ib., 1903).

THEISS, tīs (Hung. *Tisza*, Lat. *Tissus*). The largest tributary of the Danube, and, next to the latter, the principal river of Hungary (Map: Hungary, G 3). It rises in the Carpathian Mountains and flows first westward, then south, the lower half of its course being parallel with that of the Danube below Budapest. It joins the Danube about 30 miles above Belgrade. Its total length, including the smallest windings, is about 800 miles. In its upper course through the narrow mountain passes it is rapid and clear, but in the great plain of Central Hungary it is very sluggish, and winds between low, marshy banks. The country here is subject to disastrous inundations, and large sums have been expended in attempts to regulate the flow of the river and drain the marshes. The Theiss is navigable for boats to Mármaros-Sziget near its source, but steamboats ascend generally only to Szegedin at the mouth of the Maros (q.v.), the chief tributary. From the lower course of the river a canal runs westward to the Danube. The Theiss is famous for its fish.

THELLUSSON (tĕl'lŭs-son, *or Fr. pron.*, tâ'-lụ'sôɴ') **ACT.** See PERPETUITY.

THEME (Lat. *thema*, from Gk. *θέμα*, thing laid down, deposit, prize, proposition, subject, from *τιθέναι*, *tithenai*, to set, place; connected with Skt. *dhā*, OChurch Slav. *dēti*, Lat. *con-dere*, to put. place, OHG. *tuon*, Ger. *thun*, AS. *dōn*, Eng. *do*). In music, a term which is in a general sense synonymous with subject or motive (q.v.). Every composition is built up from themes which constitute the basic material. In a specific sense, the *theme* of a fugue is the *subject* (*dux*). In variations the *theme* is a complete musical idea, generally of periodic structure. It is always played in its entirety before the variations begin. See SONATA; SYMPHONY.

THE'MIS (Lat., from Gk. Θέμις, justice personified, from *τιθέναι*, *tithenai*, to set, place). In Greek mythology, the goddess and guardian of the eternal laws, established by the gods. In the Hesiodic theogony she is called the daughter of Uranus and Gæa (heaven and earth), the wife of Zeus, and, by him, mother of the Horæ (hours) and Mœræ (fates). In Æschylus she is identified with Gæa, and called mother of Prometheus. As guardian of the due order of things, she was also possessed of prophecy. The popular conceptions do not seem to have distinguished sharply between Themis and Gæa, and at Athens we hear of *Gê Themis* as a single divinity. At Rhamnus she was honored in the Temple of Nemesis, and here has been found a fine statue by Chairestratos of Rhamnus, an artist of the early third century B.C.

THEMIS'TIUS (Lat., from Gk. Θεμίστιος) (?-c.388 A.D.). A Greek rhetorician of Paphlagonia, surnamed Euphrades (eloquent), who lived at Constantinople, as a teacher of philosophy and oratory. Though a pagan in religion, he was highly honored by several of the emperors for his nobility and learning. He was tutor to Arcadius, the son of Theodosius, who made him prefect in 384. There are extant 34 of his speeches (πολιτικοί), which, though chiefly eulogisms in compliment to various emperors, contain interesting allusions to contemporary history, and instructive quotations from the ancient philosophers; and four of his paraphrases of portions of Aristotle. The orations have been edited by Dindorf (Leipzig, 1832); the paraphrases by Spengel (Leipzig, 1866).

THEMIS'TO (Lat. from Gk. Θεμιστώ). In Greek legend, the third wife of Athamas. Her husband, on discovering that his former wife, Ino, was still alive, sent for her, and Themisto in revenge planned to slay Ino's children. With this intention she directed a new slave to clothe her children in white and Ino's in black, but Ino, who was herself the slave in disguise, reversed the command, and Themisto killed her own children, whom she did not distinguish in the night.

THEMIS'TOCLES (Lat., from Gk. Θεμιστοκλῆς, *Themistoklēs*) (c.514-449 B.C.). An Athenian general and statesman, born about B.C. 514, the son of Neocles, an Athenian citizen of middling station and circumstances, and a Carian or Thracian woman. After the battle of Marathon (B.C. 490), when the first invasion of the Persians had been successfully resisted, Themistocles, with keen foresight, recognized that the final decision of the question of supremacy would come on the sea, and that the only way for the Greeks to be victorious was to have a large fleet. He aimed, therefore, at the development of a strong Athenian navy. To this end he persuaded the Athenians to devote the proceeds arising from the working of the silver mines at Laurium, which it was intended to distribute among the citizens at large, to the construction of a strong fleet. He secured the passage of a law that a certain number of new triremes should be built every year. From the time of the expulsion of Aristides by ostracism (B.C. 483), Themistocles was at the head of the politics of Athens, and in B.C. 481 was made archon eponymus. When it was learned that Xerxes was preparing a powerful armament wherewith to invade Greece, and the Athenians had been told by the Delphian oracle to defend themselves with the 'wooden wall,' it was Themistocles who interpreted this answer as referring to the ships of Athens. At the battle of Artemisium (B.C. 480) Themistocles, who was commander of the Athenian fleet, which was the largest in Greece, consented to fight under the Spartan commander, Eurybiades, but it was only through the former's tact and adroit use of bribes that the Greek commanders were finally induced to make a stand in that place. This engagement was indecisive. In the same year, at Salamis, was fought the battle which shattered the naval power of Xerxes. Here again Eurybiades was commander-in-chief, and here again it was owing to the efforts of Themistocles alone that the Greeks were induced not to retreat to the Isthmus of Corinth, but to give battle in their present position. He threatened, if a separation were now made, that the Athenians would take their women and children and sail to Italy, there to found a new home. Finally, he precipitated the contest, by dispatching to Xerxes a secret message to the effect that, if the Persians wished to crush the Greek fleet, they should advance to the attack without delay, before the Greeks had an opportunity of fleeing. After the battle of Salamis Themistocles was the most important man in Greece. When the Persians had retreated from Greece and the Athenians undertook to restore their city, the Spartans, sending an embassy to Athens, urged the Athenians not to attempt to rebuild the fortifications. Then Themistocles, going on an embassy to Sparta, entertained the Spartans with his false professions, and kept the matter in abeyance till such time as the walls were sufficiently advanced to allow of their being defended. In B.C. 471 he was ostracized and retired to Argos; and finally, to escape being tried for treason, in which, according to some accounts, he was implicated by the correspondence of Pausanias, he betook himself in B.C. 465, to the Court of Artaxerxes, King of Persia; but before he would see the King himself, got permission to wait a year, during which he made himself master of the language and usages of the country. At the end of this time he managed to raise himself so high in the King's favor that, after the Persian fashion, the town of Magnesia was appointed to supply him with bread, Lampsacus with wine, and Myus with other provisions. He lived securely at Magnesia until his death in B.C. 449. Some authorities assert that he poisoned himself. A monument was erected to Themistocles in the market-place of Magnesia, and it is said that his bones were secretly taken to Attica, and there burned. Consult: Wecklein, *Ueber Themistokles* (Munich, 1892); Bauer, *Themistokles* (Merseburg, 1881).

THÉNARD, tâ'när', LOUIS JACQUES (1777-1857). A French chemist, born at Nogent-sur-Seine. He was professor of chemistry at the Ecole Polytechnique, at the Collège de France, and at the University of Paris. From 1810 he was a member of the Institute. His original researches resulted in numerous important contributions to chemistry. He improved the methods of ultimate organic analysis; investigated the compound ethers or esters; discovered the peroxide of hydrogen, cobalt ultramarine (Thénard's blue), etc. He published: *Traité de chimie élémentaire,* *théorique et pratique*, which passed through several editions, and, jointly with Gay-Lussac, two volumes of *Recherches physico-chimiques* (1811).

THE'OBALD I. King of Navarre. See THIBAUT I.

THEOBALD, LEWIS (1688-1744). A Shakespearean editor, born at Sittingbourne, in Kent. Though educated for the law, he early turned to literature. He wrote and adapted plays, and made translations from Sophocles, Aristophanes, and other Greek authors. In 1725 Pope published an edition of Shakespeare, work for which he was ill equipped. Theobald sharply reviewed it in a volume entitled *Shakespeare Restored* (1726). Pope retaliated by making Theobald the first hero of the *Dunciad* (1728). Early in 1734 Theobald brought out his own edition of Shakespeare in seven volumes. At the time of his death Theobald was at work on an edition of Beaumont and Fletcher, which appeared six years later. Theobald's original prose and verse is of little account, but as a textual critic he possessed rare insight. His one aim was to divine, in a corrupt passage, what Shakespeare wrote, and he made over 300 corrections, which have been generally adopted. Consult Collins, *Essays and Studies* (London, 1895). See POPE, ALEXANDER; DUNCIAD.

THEOBROMINE (from Neo-Lat. *Theobroma*, from Gk. *θεός*, *theos*, god + *βρῶμα*, *brōma*, food), $C_7H_8N_4O_2$. An organic substance chemically allied to uric acid and still more closely related to caffeine (theine). It is found in considerable quantities in chocolate and may be extracted from cacao-nuts. It may also be obtained from the lead salts of xanthin by the action of methyl-iodide. Theobromine is a white crystalline substance sparingly soluble in water and forming crystalline compounds with both acids and bases. Among the compounds of theobromine may be mentioned theobromine-sodio-salicylate, a substance obtained by mixing sodium salicylate with sodium-theobromine, and used in medicine under the name of *diuretin*. Diuretin acts as a diuretic without having any action upon the heart.

THEOC'RITUS (Lat., from Gk. *Θεόκριτος*, *Theokritos*) (c.310-c.245 B.C.). The first and greatest of the Greek bucolic poets. The details of his life are not clearly known. He was commonly reckoned a Syracusan, although there is reason to believe that Cos may have been his birthplace. In any case, he spent considerable time in that island and Eastern Greece, where he was acquainted with the elegiac poet Philetas and the writer of epigrams Asclepiades, whom tradition makes his teachers, and also with the physician Nicias of Miletus and the poet Aratus of Soli. He spent some time at the Court of Ptolemy Philadelphus in Alexandria and also at the Court of Hiero II. at Syracuse; but the exact dates for these periods cannot be determined, as the chronological order of his poems is uncertain. He appears to have returned later to Eastern Greece, where he met his death. We have current under his name 31 poems and a number of epigrams. Of the longer poems 10 are bucolic, three are mimes in imitation of the mimes of Sophron and very similar to the recently discovered mimes of Herondas, and the other poems are of varying subjects and character, while a few are spurious. Theocritus displayed marvelous power in uniting artistic and popular elements in his verse in a way which has never been equaled by his followers and imitators. His language is, for the most part, a modified Doric; two poems are in the literary Æolic. In spite of the fact that Theocritus lived in an artificial period when scholarship rather than poetic genius flourished, there is still in his work a simplicity, a fidelity, and a love of nature that has given him universal fame. His dramatic and mimetic power was great, so that his peasants, shepherds, reapers, and fishermen have a real existence and are not merely literary creations, as the characters of all his imitators have been. He was imitated by Bion and Moschus among the Greeks, and by Vergil most successfully among the Romans. Important editions are by Ahrens (2 vols., Leipzig, 1855), and especially by Ziegler (Tübingen, 1879). The best edition with commentary is by Fritzsche-Hiller (Leipzig, 1881). There are English editions by Snow (London, 1885) and by Cholmeley (ib., 1901); English translations by Calverley (2d ed., Cambridge, 1869) in verse, and by Andrew Lang (New York, 1880) in prose. Consult also Legrand, *Etude sur Théocrite* (Paris, 1898).

THEODICY (from Gk. *θεός*, *theos*, god + *δίκη*, *dikē*, justice). The exposition of the theory of divine providence, and particularly the defense of the goodness and wisdom of God against objections drawn from the existence of pain and sin in the world. The problem is as old as human thinking; the name is modern and dates from the close of the seventeenth century. The first to consider the question in its entire scope was Leibnitz (q.v.) in his *Essais de théodicée* (1710). In England a long list of publications has appeared, principally in reply to the sensational school beginning with Hume and closing with J. S. Mill, who could scarcely maintain the existence of God, and saved His benevolence only at the expense of His omnipotence. In America, where Jonathan Edwards made contributions to the discussion in his famous *Freedom of the Will* (1754), and was followed by Bellamy, *Wisdom of God in the Permission of Sin* (1758); Hopkins, *Sin Through the Divine Interposition an Advantage to the Universe* (1759); and many others, down to N. W. Taylor, whose contribution to the subject may be condensed in the hypothesis that in the best moral system a benevolent God might not be able to prevent sin consistently with the maintenance of the system and the attainment of the highest results therefrom. He thus gave a place to the human will which no theologian of orthodox descent had previously given. Since the appearance of Hegel, the Christian idea of God has met with new objections, and theodicy has been enlarged to consider these, especially by Maret and Gratry in France. The appearance of pessimism in Germany has given a new turn to the argument, since it is no longer possible to assume as undisputed the principle of Leibnitz, that God has chosen the best possible world. And with the appearance of evolution and the Spencerian agnosticism, the argument has turned to the more fundamental matters; so that theodicy has almost disappeared as a distinct department of theology.

THEODOLITE (of uncertain etymology; perhaps from Gk. *θεᾶσθαι*, *theasthai*, to see +

ὁδός, *hodos*, way + λιτός, *litos*, smooth, even; hardly from Gk. θεᾶσθαι, *theasthai*, to see + δολιχός, *dolichos*, long). An instrument used in surveying especially in geodetic work for the measurement of horizontal and vertical angles. It is larger than the transit and, having larger and more carefully graduated circles, is employed in measuring angles where the highest accuracy is demanded. In its main features it is similar to this instrument, but differs chiefly in that its telescope does not revolve completely or 'transit' in its horizontal axis. The description and illustration under ENGINEERING INSTRUMENTS will convey an idea of its essential characteristics, while reference should also be made to the article GEODESY, where the method of measuring angles is discussed.

THE'ODO'RA (c.508-48). A Byzantine Empress, wife of Justinian. She was the daughter of Acacius, the keeper of the wild beasts at the circus of Constantinople, and after his death was for a time a favorite on the stage and a common prostitute. She fascinated Justinian, nephew of the Emperor Justin I., by her great beauty, and about 525 he married her. Thereafter she led an exemplary domestic life. In 527 Justinian became Emperor, and Theodora henceforth exerted a commanding influence upon public affairs. She was extremely cruel, and her numerous spies ferreted out all who were opposed to their royal mistress. At the time of the Nika Riot (532) she prevented Justinian from fleeing and brought about the suppression of the insurrection. Most of our information concerning Theodora is derived from Procopius's *Anecdota*. Consult: Marrast, *La vie byzantine au VIème siècle* (Paris, 1881); Mallet, "The Empress Theodora," in the *English Historical Review*, vol. ii. (London, 1886); Gibbon, *Decline and Fall of the Roman Empire*, ed. by Bury, vols. iv. and v. (ib., 1898).

THEODORA (?-867). Byzantine Empress. She was born in Paphlagonia and in 829 married the Emperor Theophilus (died 842), whom she succeeded in the government as Regent for her four-year-old son Michael III. While her husband was a violent iconoclast, she was attached to the worship of images, and consequently expelled the iconoclasts from office and recalled the banished image-worshipers. She also convoked the Constantinople synod of 842 which restored the images to the churches, a triumph annually celebrated in the Greek Church by the Sunday of Orthodoxy (the first Sunday in Lent). Her rule was on the whole wise, but some of her wars were unfortunate. When Michael came to the throne in 856 he deprived his mother of her position and she died in a convent.

THEODORA. A member of the Roman nobility, who lived in the tenth century. She was very beautiful, of unknown parentage, wife of the Consul Theophylact. She ruled Rome and controlled the Papacy for a long term of years, calling herself by the title of Senatrix. She was the mother of Marozia and Theodora II., who were equally licentious and unscrupulous. She placed several of her creatures on the Papal chair, among whom John X. may be specially mentioned. Consult Gregorovius, *History of the City of Rome During the Middle Ages*, translated by Hamilton (London, 1895-1902).

THEODORE, King of Abyssinia. See ABYSSINIA.

THEODORE I., King of Corsica. See NEUHOF, THEODOR VON.

THE'ODORE OF MOP'SUES'TIA (c.350-428). The most noted biblical scholar and theologian of the school of Antioch. He was born in Antioch, was educated under the rhetorician Libanius, and studied theology with Diodorus. At the age of thirty-two he was made presbyter of the Antiochian Church, and in 392 he became Bishop of Mopsuestia, a little village in Cilicia, about 40 miles from Tarsus. In fame and influence he surpassed all the other Christian teachers and writers of the East. His biblical scholarship seems almost modern. His commentaries have in many cases perished, but enough remains to show his historical spirit, and the simple, literal method of interpretation which characterized the school of Antioch, as against the mystical, allegorical method of Alexandria. Theodore expounded almost all the books of the Bible. He also wrote on the Incarnation and various other theological topics. Soon after his death, charges of doctrinal error began to be brought against him, yet no word of censure was spoken by the Council of Ephesus (431). He had no doubt favored the Pelagians, and the fact that he had been the teacher of Nestorius was afterwards remembered against him. Opposition to his theology continued and increased until the fifth general council (Constantinople, 553), when he was explicitly condemned, in connection with the 'Three Chapter Controversy.' Yet Theodore remains one of the truly great teachers of the ancient Church, worthy to be compared with Origen, whom he equaled in knowledge of the Bible, and surpassed in soundness of its interpretation. Part of the remains of Theodore's works are printed in Migne, *Patrologia Græca*, vol. lxvi. The Latin version of his commentary on the minor Pauline Epistles has been edited by Swete (Cambridge, 1880-82), and the Syriac version of his commentary on John by Chabot (Paris, 1897). The best general account of Theodore in English is the article by Swete in Smith and Wace's *Dictionary of Christian Biography*, vol. iv. Consult also, Moeller, *History of the Christian Church*, vol. i. (London, 1892); Bardenhewer, *Patrologie* (Freiburg, 1901).

THEODORE OF TAR'SUS (c.602-690). Archbishop of Canterbury. He was born at Tarsus; studied at Athens; became a monk; early distinguished himself as a scholar and was familiar with Greek and Latin literature; was consecrated at Rome as Archbishop of Canterbury by Pope Vitalian and arrived at his see May 27, 669. He did a great work for the Church in England, which at the time of his coming had sunk to a low state. He divided his large dioceses into more manageable ones; appointed worthy bishops; promoted learning and clerical discipline; increased the monasteries; held progressive synods; and so left the Church a compact and enlightened body. See ENGLAND, CHURCH OF.

THEOD'ORET (Gk. Θεοδώρητος, *Theodōrētos*) (c.393-457). A Greek Church historian and biblical scholar. He was born at Antioch, of Christian parents, and studied theology under Theodore of Mopsuestia (q.v.). Theodoret is to be classed with the Antiochian school, as opposed to the Alexandrian. He was rational rather than mystical in his theology, and historical rather than allegorical in his biblical interpretation. He entered the monastic life at Apamea, and was loth to leave his monastery when made Bishop of Cyrus in Syria (423). Theodoret achieved great success in winning back to orthodoxy the survivors of the ancient Marcionites (see Marcion), and in suppressing the use of Tatian's *Diatessaron,* a compilation of the Gospels which had long been current in Syria. (See Tatian.) His connection with the cause of Nestorius (q.v.), which began in his youth, continued until near the close of his life. He stoutly opposed Nestorius's condemnation at Ephesus (431), and denounced the famous 'Anathemas' of Cyril, which had been launched against Nestorius shortly before. His own orthodoxy was seriously questioned, and the 'Robber Synod' (449; see Ephesus, Councils of) deposed him from his see, only, however, to be reinstated by the Council of Chalcedon, two years later. Under great pressure by the Council of Chalcedon, Theodoret was finally prevailed upon to anathematize Nestorius, but he did it with the utmost reluctance, and it is doubtful whether his real opinion was ever changed. About 200 of his letters survive, giving valuable information on the events of his age. Most important perhaps of all his works is the *Ecclesiastical History,* written in continuation of Eusebius, and bringing the narrative down to 428. His *Works* have been several times edited, e.g. by Schultze (Halle, 1769-74), and Migne, *Patrologia Græca,* lxxx.-lxxxiv. An English translation of the *History, Dialogues,* and selected *Letters,* with valuable prolegomena, is given in *The Nicene Fathers,* edited by Schaff and Wace, second series, vol. iii. (New York, 1892). Consult: Harnack, *History of Dogma,* vol. iv. (London, 1898); Bright, *Age of the Fathers* (ib., 1903); Schubert-Moeller, *Lehrbuch der Kirchengeschichte* (Tübingen, 1902).

THEOD′ORIC I., King of the Visigoths (419-51). See Goths.

THEODORIC (Lat. *Theodoricus*), surnamed the Great (c.454-526). The founder of the Ostrogothic Kingdom in Italy. He was born on the banks of the Neusiedler See, in Pannonia. His father, Theudemir, was one of the three brothers who on the death of Attila (A.D. 453) freed their nation from the yoke of the Huns, and being the representatives of the royal line of the Amali, exercised a united sovereignty over it. In his eighth year Theodoric was sent as a hostage to the Eastern Emperor and was trained in all kinds of athletic and martial exercises. He returned to his people about 473 and in 474 succeeded his father as head of the nation. In the previous year the Ostrogoths had obtained parts of Mœsia and Dacia, as settlements, from the Emperor Zeno. For the next thirteen years Theodoric was frequently engaged in strife, sometimes against the Empire, sometimes in its service. In 484 he was made consul; in 478 he ravaged Thrace. The Emperor, to free himself from Theodoric, gave him permission to invade Italy, a suggestion gladly adopted by the warlike monarch, who began his march in 488, and arrived in the summer of 489 on the frontiers of Italy. Odoacer (q.v.), King of Italy, the first of the Germanic rulers of that country, was both forewarned and forearmed; and a desperate battle was fought near Aquileia (August 28, 489), the result of which was decidedly to the advantage of the Ostrogoths. A second and more disastrous defeat was inflicted on Odoacer near Verona (September 27th), after which he took refuge in Ravenna; but having again gathered a large force, he was totally routed a third time on the banks of the Adda (August, 490), and again blockaded in Ravenna, while the whole of Italy was being subdued; and having at last surrendered, was treacherously murdered (March, 493). Theodoric now assumed the title of King of Italy, resisted the claim of suzerainty preferred by the Eastern Emperor, and with the exception of a victorious campaign against the Franks, to compel them to cease their assaults on the Visigothic dominions, the suppression of a rebellion in Spain against the authority of the infant monarch, his own grandson Amalric (during whose minority Theodoric administered also the government of the Visigothic kingdom), and an expedition against the robber hordes of the Bulgarians, the whole of his long reign was devoted to the consolidation and development of his new kingdom. His followers received only one-third of the conquered country; the rest was legally secured to the rightful possessors. He made Ravenna his capital, occasionally, when his northern frontier was threatened, removing to Verona.

Theodoric showed no desire of further conquest; cultivated the friendship and esteem of the surrounding nations; ruled all classes of his subjects with irresistible authority, but with corresponding justice and moderation; zealously promoted agriculture and commerce; and, himself an Arian, exhibited a tolerance of all other sects which was then almost unknown. The one great error of his administration consisted in his wholly neglecting to assimilate his Ostrogothic subjects with the previous inhabitants, either by a common code of laws or by common official preferment. Theodoric left no son; but his daughter, Amalasuntha (q.v.), succeeded him as regent for her son, Athalaric. Theodoric became a hero of many Germanic legends under the name of Dietrich of Bern. Among the men who held office under Theodoric were Boëthius and Cassiodorus. The former, who had incurred the suspicions of the monarch toward the close of his reign, was unjustly put to death. Consult: Hodgkin, *Theodoric the Goth* (London and New York, 1893); Gibbon, *Decline and Fall,* vol. iv., ed. by Bury (London and New York, 1898); Hodgkin, *Italy and Her Invaders,* vol. iii. (Oxford, 1885); Dahn, *Die Könige der Germanen,* part iii. (Würzburg, 1866).

THEODORIC, TOMB OF. A structure near Ravenna, Italy, erected about 530 as a mausoleum by Theodoric's daughter. It is now the Church of Santa Maria della Rotonda. The edifice rests on a substructure of ten arches and has a flat dome, 36 feet in diameter, formed of a single block, reputed to weigh 470 tons.

THEODOSIA, thē′ō-dō′shĭ-ȧ, or **FEODOSIA.** A seaport of the Crimea. See Kaffa.

THEODOSIUS, thē′ō-dō′shĭ-ụs. The name of three Roman emperors.—Theodosius I., surnamed the Great, Emperor from 379 to 395, was of Spanish descent, and was born either at Italica, or more probably at Cauca, near Segovia, about A.D. 346. His father, also named Theodosius, was the great general of the Roman Empire, who, after freeing South Britain from the Caledonians, and annihilating the formidable rebellion of the Moor Firmus, was beheaded at Carthage in 376. Theodosius, who had accompanied his father in his British campaigns, and afterwards, by routing the Sarmatians, saved Mœsia from devastation, retired from active service after his father's murder, and occupied himself with the care of his patrimonial lands in Spain. But on the defeat and death of Valens (q.v.), his colleague, Gratianus (q.v.), feeling his inability to sustain alone the cares of empire, summoned Theodosius from his retirement, invested him with the Imperial purple, and intrusted to him, January 19, 379, the administration of Thrace, Dacia, Macedonia, Egypt, and the East, and especially the protection of the Empire against the Goths. This last charge called for the full exercise of the new Emperor's abilities, for the army at his command dared not face the Goths in the open field. Theodosius found it most prudent to sow jealousy and dissension among them by promises and bribes, and after a four years' so-called campaign, succeeded in pacifying the Visigoths, the Ostrogoths retreating toward Scythia. The latter returned in 386, their ranks swelled by Scythians, but were totally routed in attempting to pass the Danube, and the survivors were transported to Phrygia and Lydia.

In 387 Theodosius undertook to restore to the throne of the Western Empire Valentinian II. (whose sister, Galla, he married), the brother of Gratian, who had been expelled by Maximus; and after a uniformly successful contest, the usurper was captured and put to death at Aquileia (388). In 392 the suspicious death of Valentinian and the elevation of the puppet Eugenius by Arbogastes, the real ruler of the West, again summoned Theodosius to interfere; and after two years of preparation his army gained a complete victory over the army of the West, and the two portions of the Roman Empire were again united under one ruler. The union, however, lasted only four months, owing to the death of Theodosius, January 17, 395. Theodosius, though a professor of the orthodox Christian faith, was not baptized till 380, and his behavior after that period stamps him as one of the most cruel and vindictive persecutors who ever wore the purple. His humiliation before Saint Ambrose, Bishop of Milan, for the massacre at Thessalonica, was regarded by the Church as one of its greatest victories over the temporal power. See AMBROSE.

THEODOSIUS II., Emperor of the East from 408 to 450, was the only son and successor of Arcadius (q.v.). He was but seven years old when he ascended the throne. The chief events of his reign were the invasion of the Empire by the Huns under Attila, a war with Persia, renewed efforts to extirpate paganism, and the compilation of the *Codex Theodosianus.* See CODE.—THEODOSIUS III. was an unimportant Byzantine Emperor (A.D. 716-717), who abdicated after a few months' reign.

THEODOSIUS, ARCH OF. A triumphal arch at Rome, erected in A.D. 405 at the approach to the Pons Vaticanus, in honor of the three emperors Arcadius, Honorius, and Theodosius, in commemoration of their destruction of the Goths.

THEOG′NIS (Lat., from Gk. *Θέογνις*) (6th century B.C.). A Greek elegiac poet, born at Nisæan Megara. During the conflict in his native city between the aristocratic and democratic parties, in which he took the side of the aristocrats, he lost his estate and was reduced to poverty and driven into exile. He appears to have visited Sicily, Bœotia, Eubœa, and Sparta, and later, apparently under changed conditions, he returned to his native city. Theognis is the only elegiac poet whose works have come down to us in anything like complete condition. We possess under his name 1389 verses in two books which set forth the political belief and ideals of the Dorian oligarchs. The work is fragmentary and has suffered largely from interpolations. The genuine remains of his work are valuable evidence as to the state of political parties and social conditions in the sixth century. The fragments are edited by Bergk in his *Poetæ Lyrici Græci* (4th ed., Leipzig, 1882); by Ziegler (2d ed., Tübingen, 1880); by Sitzler (Heidelberg, 1880); and by Hartmann in his *Studies in Theognis* (Cambridge, 1902).

THEOGONY (Lat. *theogonia*, from Gk. *θεογονία*, generation of the gods, from *θεός*, *theos*, god + *-γονία*, *-gonia*, generation, from *γόνος*, *gonos*, seed). A genealogy of the gods. The earliest theogonies among the Greeks were that of the epic cycle, of unknown authorship, now lost, and the extant work of Hesiod. According to Pausanias, the poems of Onomacritus, who lived at the close of the sixth century B.C., belonged to this class. The Orphic theogony, which had a great influence among the Neo-Platonists, was composed at a late period, although it may have embodied much of the earlier Orphic doctrine. See HESIOD.

THEOLOGICAL EDUCATION. The system of training in theology, with special reference to professional preparation for the work of the ministry. It will naturally have to be considered under two main heads, owing to fundamental differences in the point of view.

THE CATHOLIC SYSTEM.

The older system of theological education, that prevailing in Catholic institutions, is the result of a gradual historical development from the beginning of the Church. Although the aim and ideal have remained unchanged, the matter has broadened and the lines widened and deepened in response to the demands on the Church's organic activity. The training of the subject, the man, has ever been its first and most important function—consisting in the assimilating of his mind to the object matter of the theological disciplines and of his conduct to the ideal of the priestly vocation. The first thologians were educated and instructed in the school of Christ. They in turn handed on to their disciples what they had received from their master. Its matter was the Bible, the Old and New Testament, the latter especially, with the oral interpretation gathered and treasured from the instructions of Jesus. The form was simple, unsystematic, adapted to the synthetic soul rather than the analytic mind. Both aspects—the matter and the form—are indicated with sufficient detail to enable one to estimate their character in the letter of Saint Paul to Titus and his two letters to Timothy. Contact with Judaism developed a somewhat more definite exegesis, and conflict with paganism a direct apologetic. The necessity of defining and defending the explicit content of revelation resulted in a gradual growth of dogmatics, with a well-marked branch of polemics, while the bearings of the new religious-moral truths on the growing complexities of life in the world and the cloister necessitated an unfolding of moral and ascetical theology. Eusebius in the meantime had founded ecclesiastical history, and with the Decretists and the Decretalists canon law received an organic shape. After the collapse of the Roman Empire educational activity, theological as well as secular, was practically confined to the monasteries, and was limited to the conserving of the materials inherited from the past.

Throughout the Middle Ages the various branches of the theological curriculum became more systematic and coördinated. Biblical study was emphasized, though principal attention was given to the philosophico-theological systematization of the speculative content of religious faith and to the motives, faculties, and laws of moral and religious conduct. Historical and critical studies were, however, but slightly and superficially cultivated.

A great change begins with the rise of the Humanists and the Reformation, followed by the opposite reform instituted by the Council of Trent. Progress lay principally in the circle of biblical and historical studies. Exegesis was pursued with great zeal, and the study of the Bible centred mainly on historico-critical questions. The founder of isagogics as a special discipline was Richard Simon, and in the second half of the eighteenth century, in which, besides, the division of theology into separate departments was completed, it was marked off against the rest of biblical science. In Church history, reëstablished by Baronius (1607), the auxiliary sciences attained chiefly through the Benedictines of Saint Maur their form and demarcation: patrology, archæology, and chronology. In criticism of sources Mabillon (1707), in the study of the Catacombs Bosio (1639), in hagiography Bollandus (1665), were most prominent. Besides these Petavius (1652) and Thomassin (1695) established scientifically the history of dogma, which since the latter half of the eighteenth century has been independent. In systematic theology, moral theology, which had made great advance, separated definitely from dogmatic and was raised to an independent discipline. Casuistry received particular interest and care. In dogmatics Melchior Cano (1560) created by his *Loci Theologici* the science of theological noetics, to which Stapleton (*De Principiis Fidei Doctrinæ*) gave scientific finish. In post-Tridentine dogmatics, polemics took a broad and important place. To it men like Bellarmine, Suarez, and Soto devoted their best powers. Mystics and ascetics, earnestly cultivated even in patristic times (their founder was the Pseudo-Dionysius), were greatly developed, but attained no independent position. They remained, like casuistics, in connection with and in the service of moral theology. Thus the theological cycle was, at the close of the sixteenth century, divided into the following departments: Biblical science (undivided), Church history, dogmatics, moral and canon law. The differentiation of the other theological disciplines was accomplished only in the second half of the eighteenth century. The latest to appear as a separate branch was pastoral theology, in Germany, with the erection of a special chair for its teaching under Maria Theresa. Later on it divided into three departments: homiletics, liturgics, and the theory of the pastoral life. Apologetics, as fundamental theology, though zealously cultivated for centuries, separated from dogmatics only in the nineteenth century.

The actual curriculum of the ecclesiastical, or, as it is usually called, the diocesan seminary, in which the system of theological education is imparted, dates in its present organization from the Council of Trent, but, like the system itself, is the outcome of a gradual historical growth. In the early centuries theological education was received partly at central catechetical schools (e.g. at Alexandria and Antioch), but chiefly at the bishop's residence and under his guidance and spirit. The episcopal school was afterwards supplemented by the monastic institutions and the schools established by Charlemagne. These in turn were succeeded by the great mediæval universities and the *collegia* attached thereto. The growing laxity of discipline at these institutions induced the Council of Trent to establish the present seminary system, which since then has gradually become universal throughout the Church. The purpose of these institutions, one or more of which exist in almost every diocese or ecclesiastical province, is primarily a moral one; the training of the person, the forming of the youth, by strict discipline and the practices of religion, to habits of self-control and to the shaping of his life in harmony with the priestly ideal. The graded course of study pursued in them averages from ten to twelve years, divided into three distinct but closely connected stages: the preparatory, the philosophical, and the strictly theological, to which the first two are subordinate. In the preparatory department the usual college studies are pursued, though special importance is placed on Latin. As this language is the vehicle of most of the subsequent studies—text-book and lecture being usually in Latin—the student passing from the preparatory seminary is required to have an easy reading familiarity and a fair speaking facility in the language. The two years of philosophy are devoted to logic, psychology, metaphysics, and ethics (including sociology), the physical sciences, Hebrew, and Greek. The theological curriculum of four years is organized on the following lines:

I. *Theology in Its Unity* (*Synthesis*).—(1) The theologian: His ideal, moral, and intellectual equipment; preparatory training in languages, philosophy, history, natural sciences, and arts. (2) Nature, origin, and classification of religion. (3) Relation of theology to religion. (4) Object, nature, relations (to reason and faith), and history of theological science.

II. *Departments of Theology* (*Analysis*).—A. *Historical.*—(1) The Bible, criticism, exegesis. (2) Biblical theology: (a) history of the Old and New Testament; (b) their general doctrinal contents; (c) aids to study: biblical philology, archæology, hermeneutics. (3) Church history: (1) scope, methods, epochs; (2) divisions: (a) patrology; (b) symbolism; (c) ecclesiastical archæology and art; (d) auxiliary disciplines: geography and statistics, ecclesiastical chronology, and philology.

B. *Systematic Theology.*—(1) Apologetics; (2) dogmatics, relation to morals; (3) moral theology (Christian ethics).

C. *Practical Theology.*—(1) The Christian pastorate as a continuation of Christ's ministry in its several departments, magisterial, sacerdotal, gubernatorial. (2) Divisions: catechetics: pastoral didactics; the instruction of children. (3) Homiletics: theory of sacred eloquence. (4) Liturgy. (5) Theory of the relations of pastor and people.

D. *Canon Law.*—Science of ecclesiastical discipline.

In some minor details the foregoing programme will vary according to local convenience. On the whole, however, the course as outlined is followed in every ecclesiastical seminary. As at each successive stage in the Church's history special care was devoted to one or other of the theological branches in answer to external and internal exigencies, so, too, at the present day. In the philosophical department empirical psychology, epistemology, and sociology are absorbing more interest and are being pursued in a more historical light and a more critical spirit than was the case a generation ago. The same is true of biblical studies, ecclesiastical history, and apologetics within the theological domain.

From the foregoing account it will be readily inferred that the question of 'reconstructing theology,' which has of late been engrossing many minds outside the Catholic Church, has no meaning in connection with the system of theological education within her pale. The primary principles of that system are the 'articles of faith' contained within the deposit of revealed truth, which, together with the assurance of inerrancy in discerning, formulating, and interpreting them, she claims to have received from her Founder. In the exercise of the logical faculty developing those principles and coördinating the conclusions into a systematic body of theological science, in the work of the critical faculty within the domains of biblical, historical, and scientific studies, she recognizes the fullest rights of human reason, provided it does not usurp the license of transgressing the ascertained manifestations of the divine reason.

BIBLIOGRAPHY. The best work in English is Hogan's *Clerical Studies* (Boston, 1898). Kihn's *Encyklopädie und Methodologie der Theologie* (Freiburg, 1892) is profound, erudite, and rich in bibliography. Krieg's *Encyklopädie der Theologischen Wissenschaften* (ib., 1899) has the same qualities, but is more compendious. Consult also: Didiot, *Cours de théologie catholique* (Paris, 1894); Aubry, *Idées sur la théorie catholique des sciences et sur la synthèse des connaissances humaines dans la théologie;* id., *Les grands séminaires en France* (Paris, 1894); Wilhelm and Scannell, *Manual of Catholic Theology*, based on Scheeben's *Dogmatik;* and Hunter, *Outlines of Dogmatic Theology* (London, and New York, 1890).

THE PROTESTANT SYSTEM.

The great leaders of the Protestant Reformation insisted upon the necessity of higher education for the clergy at the universities. This was natural, as they believed in an established Church supported by the State, and strongly emphasized the duty of its ministers to inculcate sound doctrine, which necessitates special theological training. The Baptist thinkers, who contended for freedom of conscience, liberty of prophesying, and complete separation of Church and State, put the emphasis so strongly upon experience and conduct as to make doctrinal agreement a matter of secondary importance, and the education of a special clerical class seem undesirable. It was fortunate that the prevailing tendencies made a home for Protestant theology at the great centres of intellectual life. The theological curriculum at the universities was changed in several respects, particularly by the greater attention given to the biblical studies, the importance attached to the Hebrew and Greek texts, and the more or less determined abandonment of the allegorical method of interpretation. Other Lutheran universities modeled their course upon that prescribed by Luther and Melanchthon at Wittenberg. Between 1529 and 1563 this system was introduced at Marburg, Tübingen, Leipzig, Königsberg, Greifswald, Heidelberg, Jena, Rostock, Upsala, and Copenhagen. Similar courses of theological study were established by Beza at Lausanne, by Calvin at Geneva, and theological schools at Nîmes, Sedan, Saumur, and Montauban followed the same methods. In Holland the University of Leyden (founded 1575) became the centre of Protestant theology. The Free Church in Scotland established three divinity halls at Edinburgh, Aberdeen, and Glasgow, and the theological education at the Universities of Saint Andrews, Aberdeen, and Glasgow was likewise modified in character. Cambridge, under the teachings of Erasmus, Tyndale, and Latimer, became the foremost exponent of the new theological as well as humanistic teaching, and Vermigli at Oxford expounded Protestant principles of exegesis.

If the theological education of the Reformation period was chiefly characterized by the greater attention paid to the Bible, and a certain movement of thought away from Catholic dogma, its most marked peculiarity in the immediately succeeding period was the inculcation of Protestant dogma, on which a growing emphasis was placed. In Germany the type of teaching represented by Flacius proved more acceptable than that of Melanchthon and his followers, and Calovius bore off the victory over Calixtus and the Helmstedt school. The greatest service rendered by Flacius was the attention he and the other Magdeburg Centuriators paid to the history of the Church. New centres of theological study were created at Giessen, Kiel, Dorpat, Lund, Gröningen, and Utrecht. In Holland the orthodox tendencies prevailing at the Synod of Dort were offset by the influence of Scaliger and Grotius. In the French schools Cameron, Amyrault, and Louis Cappel maintained a more liberal type of thought. The expatriation of the Huguenots left only Montauban as a Protestant school. In England the theological education was less affected by exaggerated doctrine concerning the Bible than was the case in Germany, Switzerland, and Holland. The colonies were long supplied by ministers who had had their training in European universities. A professorship in divinity was established at Harvard in 1638, and a similar provision was made at Yale in 1740.

A new direction was given to theological education by the Pietist movement. At Halle a university was founded in 1694, where it was possible for Spener and Francke to exemplify their principles. They maintained that the Christian minister must himself have a profound religious experience, that he should not be bound by an oath to teach in accordance with man-made creeds, but that he should proclaim the word of God contained in the Scriptures. The influence of English Quakerism with its doctrine of the inner light and its protest against a hireling ministry is unmistakable. In the *seminarium ministerii ecclesiastici* established at Halle in 1714 Francke endeavored to give to converted men desirous to serve as preachers such a knowledge of the Bible and such an acquaintance with the practical duties of the pastor as to fit them to be true spiritual leaders. While the demand for a spiritual crisis rather than a normal growth of religious experience could not be carried out in a State Church and had a tendency to foster self-deception, the break with dogmatism and the centring of interest upon the practical aspect of the ministry, the training of the man rather than the elaboration of his doctrine, bore permanent results. The appeal to Christian consciousness and the disregard for the letter led to biblical criticism, as is seen in Dippel, Edelmann, Michaelis, Zinzendorf, and Semler, and a new estimate of the history of the Church, doing more justice to the heretical bodies, was introduced by Gottfried Arnold.

At the English universities rationalism exercised a greater influence than pietism. This was largely the result of the zealous cultivation of natural science. The idea that revelation itself is to stand or fall by the test of reason was accepted by the apologists as well as by the Deists, by Lardner and Paley not less than by Collins and Toland. From England this rationalistic movement spread to the Continent. In the school of the Remonstrants at Amsterdam, Le Clerc expounded to theological students the principles of Collins and Locke. Göttingen was established in 1737, largely to serve as a bulwark against supernaturalism, and other centres of rationalism were Jena, Helmstedt, and Heidelberg. Theological students came under the influence not only of Eichhorn, Paulus, and Henke, but also of such men as Reimarus and Lessing, Herder and Goethe, Kant and Fichte. If the effect of pietism upon theological education was that much stress was laid upon the conscious experience of an inner change, and the nourishment of religious emotion, rationalism put the emphasis upon the reasonableness of true religion and the supremacy of morality.

During the nineteenth century certain important changes occurred. A large number of schools grew up in Europe and America. In Germany the most important additions were the Universities of Berlin (1810), Bonn (1818), and Strassburg (reorganized 1871). In Switzerland schools unsupported by the State have been established at Geneva, Lausanne, Neuchâtel, Basel, Bern, and Zurich, and State universities teaching theology at Fribourg and Neuchâtel. In France the theological faculty of the University of Strassburg was removed to Paris in 1877, and the Ecole des Hautes Etudes was founded in 1868. The University of Amsterdam was established in 1877, and universities were founded in Christiania in 1813, and Helsingfors in 1827. Besides Oxford, Cambridge, and Durham, the Church of England has twenty-three theological schools, the English Methodists ten, the Congregationalists eleven, the Baptists nine, the Presbyterians three, the Unitarians one, and two are undenominational. Except the Dutch Reformed Seminary at New Brunswick, N. J. (1784), and the United Presbyterian Seminary at Xenia, Ohio (1794), all Protestant schools of theology in the United States have been founded in the nineteenth century. They number about 120. When the large extent of territory, the numerous denominations, and the special needs of the colored and the foreign churches are considered, the number is not excessive. Concerning many of them, however, it must be said that they are very inadequately equipped, both as to teaching force and library facilities, and they do not represent a high grade of scholarship. Some of these are connected with universities. Many are located in or near important educational centres. The course is generally three years in length, and a collegiate training is as a rule required for admission.

A tendency to seek independence of educational control is characteristic of the period. In Germany, Switzerland, Holland, and France the principle of academic freedom has won general recognition. Berlin at the outset repudiated all attachment to any particular creed or school. While pressure is often brought to bear in the matter of appointments, the tradition of a German university is generally the determining feature. In Holland the relations between pulpit and chair are more cordial. In England and Scotland freedom of investigation is now generally granted to the biblical teachers. All higher institutions of learning in the United States were for a long time either founded by religious bodies or privately endowed. The former were naturally controlled by the denominations supporting them; the latter either give no theological instruction or are affiliated with some ecclesiastical organization. Theology is not taught in any of the State universities founded in the latter part of the century. But as it is widely felt that the various disciplines that enter into the theological curriculum have a universal human interest, and should be studied in an atmosphere of scientific research and free from ecclesiastical dictation, many of them have found a way into such universities as Johns Hopkins, Cornell, Columbia, Pennsylvania, Michigan, California, and others. Harvard by making its school undenominational has taken an important step in this direction.

The most significant change in theological education during the century was the general introduction of historico-critical methods of investigation. In the interpretation of Hebrew and early Christian literature, and the study of Church history, German theological teachers have been the chief leaders; but, owing to the relations of the faculties to the Christian State as well as to the Church, no provision is yet made in any German university for the comparative study of the religions of mankind. Paris offers the amplest facilities for such study, but Leyden and Amsterdam also pay considerable attention to it. Critical methods prevail in Old Testament exegesis in Great Britain and America, as well as in the European universities. There is less consistency in their application to New Testament exegesis. The treatment of ecclesiastical history is characterized by increasing fairness and objectivity. While many contributions have been made to dogmatics by theological teachers, the acceptance of the results of criticism has tended to render impossible the old type of systematic theology. In so far as it concerned itself with the Bible and the creeds, biblical theology, embracing the religious views of the biblical writers and the history and philosophy of Christian dogma, has taken its place. In so far as it attempted to bring all truth into one system, it can survive only as comparative theology studies all the religious phenomena of man's life. For this there is no adequate provision in any theological school in the English-speaking world, though at some universities there are chairs for the history and philosophy of religion. The introduction of such a course is likely to cause a profound change not only in the theological curriculum, but in the spirit of theological study. Consult: K. A. Schmid, *Geschichte der Erziehung* (Stuttgart, 1884-92); K. Schmidt, *Geschichte der Erziehung* (Köthen, 1876); W. Lexis, *Die deutschen Universitäten* (Berlin, 1893).

THEOLOGICAL SEMINARY OF THE REFORMED CHURCH IN AMERICA. A divinity school at New Brunswick, N. J., organized in 1784. Its classes were held in New York City until 1796, and at Flatbush, L. I., till 1810, when it was removed to its present home. The seminary is under the direct control of the General Synod of the Reformed Church. Its theology is in sympathy with the moderate Calvinism of the Reformed Church standards. The school has a well-equipped dormitory, Peter Hertzog Hall; a capacious building, James Suydam Hall, devoted to lecture rooms, museums, and gymnasium; a fireproof library in the Gardner A. Sage building, containing in 1903 over 47,000 volumes; and six dwelling houses for professors. In 1903 its endowment was $473,000, and the attendance was 27, with a faculty of six instructors.

THEOLOGY (Lat *theologia*, from Gk. *θεολογία*, a speaking concerning God, from *θεός*, *theos*, god + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). A term which, in the larger sense, may be used as equivalent to the science of religion, and will then include all the various theological disciplines, the sacred languages, and the interpretation of the Bible; the history of the Church, including the history of doctrine; the history of religions in general; the contributions of our own age to the knowledge of the objects of theological study from other sciences, such as biology; systematic theology, or the system of doctrines and duties; and, finally, practical theology, or the application of theology to life, in the pulpit, in Church administration, and in the various forms of contact with the world. But more strictly and correctly, the term theology is employed of systematic theology, which may be defined as the science of Christianity, or the scientific explanation of the specific Christian life, the development of its characteristic principles, conditions, and general relations. Viewed thus it yields a system of doctrines and a system of duties, or dogmatics and ethics.

The claim of theology to be a science depends upon the question whether there are any peculiar facts of which it takes cognizance, as it professes, and whether its method is calculated to yield reliable knowledge. As to the facts, these are not tangible facts, and if tangibility is made the criterion of reality, as is done by some writers, the case is closed against theology. But Christians claim for themselves great facts of spiritual experience, which are matters of consciousness and thus belong in the same category as the facts of psychology. And if once the inspiration of the Bible is reached by processes of reasoning which are valid and hence yield true, though not tangible results, the teachings of this book form a body of objective facts which are capable of scientific treatment, and indeed demand it. Modern theology has largely followed the method which is as valid in theology as in chemistry or biology, though some theologies have been and some still are *a priori*.

Formerly a sharp distinction was drawn between natural and revealed theology. The former embraced those doctrines as to God, freedom, and immortality which could be reached without the aid of revelation, and upon them was built the proof of the Bible as a revelation from God, and consequently the system of revealed theology, which was then conceived as exclusively the scientific interpretation of the Bible. But with the increasing evidence that even the first doctrines of natural theology, such as the existence of God, have been historically dependent upon revelation, and that the doctrines of revealed theology have their confirmation in facts drawn from other sources than the Bible, the sharp line between the two departments has been largely erased. Natural theology is now replaced by apologetics, the business of which is to defend the doctrines developed by systematic theology.

Many of the special topics of theology will be found treated in separate articles. See also such articles as DEVELOPMENT OF DOCTRINE; GERMAN THEOLOGY; THEOLOGICAL EDUCATION. No attempt can be made here to give an adequate selection from the literature in all departments. Mention may be made of the histories of doctrine, such as Hagenbach (Leipzig, 1840; 12th ed. 1889; Eng. trans., Edinburgh, 1846, revised and enlarged, New York, 1861); Baur (Stuttgart, 1847; 3d ed. 1867); Neander (Berlin, 1857; Eng. trans., London. 1858); Schmid (Nördlingen, 1860; 4th ed. 1887); Dorner (*Geschichte der protestantischen Theologie*, Munich, 1867; Eng. trans., Edinburgh, 1871; *System der christlichen Glaubenslehre*, Berlin, 1879-81; 2d ed. 1886-88); Thomasius (Erlangen, 1874-76; 2d ed. 1886-89); Werner (Munich, 1889); Loofs (Halle, 1889; 3d ed. 1893); Harnack (Freiburg, 1889; 3d ed. 1898; Eng. trans., Boston, 1895-97). The histories of doctrine of Shedd (New York, 1869), Sheldon (ib., 1886), and Fisher (ib., 1896) are brief manuals by American writers. Charles Hodge, *Systematic Theology* (New York, 1872), presents the Calvinistic system. Watson, *Theological Institutes* (London, 1822-28; 8th ed. 1850), is a standard

Methodist work. The *Systematic Theology* of A. H. Strong (Rochester, 1886) is by a Baptist. Percival, *Digest of Theology* (Philadelphia, 1892), and Mortimer, *Catholic Faith and Practice* (London, 1901), are scholarly presentations of the High Church Anglican view of the teaching of the undivided Church. Treatises from the point of view of the different religious denominations will be found mentioned in many of the articles upon the various religious bodies. The standard encyclopædic works are the Herzog *Realencyklopädie* (2d ed., 18 vols., Leipzig, 1877-88; 3d ed., by Hauck, 1896 et seq.), and (Roman Catholic) Wetzer and Welte, *Kirchenlexikon* (12 vols., Freiburg, 1882-1901).

THE'ON (Lat., from Gk. Θέων) **OF ALEXANDRIA** (c.370 A.D.). One of the last of the Greek mathematicians and astronomers. He was a teacher at Alexandria and the father of the celebrated Hypatia (q.v.), whose name is also connected with the history of mathematical science. Theon's chief works are an edition of Euclid's *Elements* and a commentary on Ptolemy's *Almagest*. The former was prepared for his students at Alexandria and the various manuscripts have played an important rôle in all subsequent attempts to reproduce the *Elements*. The latter is especially valuable for its notes showing the use of sexagesimal fractions, and the operations of division and square root.

THEON OF SMYRNA, smĕr'nȧ (c.100 A.D). A Greek mathematician and astronomer. He was the author of a work, commonly known as the *Expositio*, treating of mathematical rules necessary for the study of Plato. Two books of this work, probably the whole of it, are extant, one on arithmetic and the other on astronomy. The work contains two propositions on the theory of numbers of peculiar interest: (1) If n be any number, n^2 or $n^2—1$ is divisible by 3 or 4 or both. If n^2 is divisible by 3 and not by 4, $n^2—1$ is divisible by 4. (2) If two groups of numbers be arranged as follows:

$$\begin{array}{ll}
n_1=1+0 & d_1=\ 1+0=\ 1\\
n_2=1+1 & d_2=\ 2+1=\ 3\\
n_3=2+3 & d_3=\ 4+3=\ 7\\
n_4=5+7 & d_4=10+7=17\\
\cdots\cdots\cdots & \cdots\cdots\cdots\cdots\cdots\\
\cdots\cdots\cdots & \cdots\cdots\cdots\cdots\cdots\\
n_r=n_{r-1}+d_{r-1} & d_r=2n_{r-1}+d_{r-1},
\end{array}$$

then d^2 is of the form $2n^2\pm1$; e.g. $d_1^2=1=2.n_1^2—1$, $d_2^2=9=2.n_2^2+1$. Theon called these numbers *diameters*. It is interesting to observe that the ratios

$$\frac{d_1}{n_1}=1,\ \frac{d_2}{n_2}=\frac{3}{2},\ \frac{d_3}{n_3}=\frac{7}{5},\ \text{-----}$$

are the convergents of the continued fraction

$$1+\frac{1}{2}\,\frac{1}{+2}\,\frac{1}{+2},\cdots$$

and hence approximate the value of $\sqrt{2}$, also that these diameters are solutions of a pair of indeterminate quadratic equations, relations unknown to Theon.

THEOPH'ANO (c.955-91). The wife of Otho II. of the Holy Roman Empire. She was the daughter of the Byzantine Emperor Romanus II., and was married to Otho II. at Rome in 972. She was a woman of great beauty and noble character and soon won great influence over the Emperor, in whose Court she introduced much of the learning and refinement of Constantinople. After the death of her husband (983) she ruled as Regent for her son Otho III. till her death.

THEOPHANY (ML. *theophania*, *theofania*, from Gk. θεοφάνια, *theophania*, θεοφάνεια, *theophaneia*, manifestation of a divinity, from θεός, *theos*, god + φαίνεσθαι, *phainesthai*, to appear). An appearance of gods, or of God, to men. In the heathen religions theophanies under various forms were regarded as of frequent occurrence. In Christianity the term has sometimes been applied to the appearance of God in Christ, in distinction from the *epiphany*, which was the appearance in the form of a dove, and the audible communication of God, at the baptism of Jesus (Mark i. 9-11 and parallels). It is now generally restricted to the appearances of God as related in the Old Testament. They are presented in many ways as simple historical occurrences, often without suggestion as to the manner, sometimes as in the form of man, sometimes as the 'angel of Jehovah.'

THEOPHILANTHROPISTS (from Gk. θεός, .*theos*, god + φιλανθρωπία, *philanthrōpia*, love to man, from φίλος, *philos*, dear + ἄνθρωπος, *anthrōpos*, man). A sect which arose in France under the Directory, hèld its first meeting on January 15, 1797, and was dissolved by Napoleon in 1802. They reduced all religion to the doctrines of God and immortality and the principles of morality resulting from these. They established regular divine service, which had its liturgy, its prayer and hymn book, and its preachers. They received from the Directory ten churches in Paris for their assemblies, and spread somewhat throughout the country. Their spirit and purpose may be seen from their creed: "We believe in the existence of God and the immortality of the soul. Pray to God, love your brother, make yourself useful to your country. The good is everything that serves to support and perfect man, the evil what has a tendency to corrupt and debase him. Children, honor your fathers and mothers, obey with loyalty, support their age; fathers and mothers, instruct your children. Wives, behold in your husbands the heads of your houses, and make one another happy." Thomas Paine was a member of the sect. Their literary productions were printed at Basel (2 vols., 1797-99). Consult Grégoire, *Histoire des sectes religieuses*, vol. i. (Paris, 1828).

THEOPH'ILUS (Lat., from Gk. Θεόφιλος). The person to whom the author of the third Gospel and the Acts addressed these works. He is spoken of in terms of highest respect, as 'most excellent.' The notices (Luke i. 1-4, Acts i. 1) imply that he was a man of some standing, the friend, if not the patron, of the evangelist, and a convert to Christianity, who would be interested in a full and accurate account of its beginnings. Beyond these notices nothing is known of him. Early Christian tradition is silent concerning him. Later conjectures, ancient and modern, are more interesting than convincing. Some, following a hint by Origen, have conjectured that the term is used by Luke in a fictitious sense, since all Christians are *theophiloi* (lovers or friends of God). Ramsay (*Saint Paul the Traveller and the Roman Citizen*, p. 388) thinks that the term 'most excellent' implies that Theophilus was an officer of equestrian rank. Antioch, Rome, Greece, and Alexandria have all been advocated as his place of residence.

THEOPHILUS. One of the most important precursors of Dr. Faust. The facts appear to be that in the sixth century there was a Theophilus who was treasurer of the church at Adana, near Tarsus, in Cilicia Secunda. He was elected bishop, but refused the honor, out of humility. The new bishop removed him from his office. Later he adopted heretical views, but on repentance was forgiven and restored. These facts were embellished by later story-tellers, until the legend arose that after his deposition he had recourse to a Jew magician, who took him to a midnight meeting of devils. But he was soon overtaken with remorse, and, through forty days' fasting and prayers, prevailed on Mary to intercede with her Son for him. Then he made a public confession of his crime, told of the goodness of the Virgin Mary, and died three days after. This legend, whose origin is traced back to an unknown Greek of the name of Eutychianus, was brought, during the tenth century, to the West, where it quickly spread far and wide. It was made the subject of poems and dramas in many languages, and frequent allusions to it are found in Latin, German, Anglo-Saxon, Icelandic, Swedish, French, and Spanish literature.

THE′OPHRAS′TUS (Lat., from Gk. Θεόφραστος) (c.372-287 B.C.). A Greek philosopher, born at Eresus, in Lesbos. He studied philosophy at Athens, first under Plato and subsequently under Aristotle, who at his death made him head of the Peripatetic School, which he directed for thirty-five years, 322-287. Under his leadership the character of the school was well maintained; it had a large number of pupils, and enjoyed a high reputation at home and abroad. In philosophy he followed closely in the footsteps of his master, but was more inclined to natural history than to metaphysics. His discourses on ethics were greatly admired, but his chief renown was gained by his botanical works. Two of these, his *History of Plants*, in nine books, and his *Theoretical Botany*, in six, are still extant, together with fragments of his work *On Mineralogy* (Περὶ λίθων), *On Fire* (Περὶ πυρός), *On the Senses* (Περὶ αἰσθησέων καὶ αἰσθητῶν), *Metaphysics* (Μεταφυσικά), and other similar subjects. Especially famous is his book of sketches called *Characters* (Χαρακτῆρες). They have been extremely popular and have been imitated many times, especially by the French and English of the eighteenth century. The best complete editions of his works are by Schneider (Leipzig, 1818) and by Wimmer (Paris, 1866). The *Characters* have been many times edited separately. Especially famous is the edition by Casaubon with commentary (Leyden, 1592); edited also by Ussing (Copenhagen, 1868), by Jebb (London, 1870), and with translation and commentary by the Leipzig Philological Society (1897).

THEOPH′YLACT (Gk. Θεοφυλάκτος, *Theophylaktos*) (died c.1107). A Bible commentator, born probably at Constantinople. He became tutor to Constantinus Porphyrogenitus, son of Michael VII. In 1078 Theophylact was made Archbishop of Achrida and Metropolitan of Bulgaria. He labored diligently to extend Christianity, but was hindered by the half-civilized people of his diocese, and vainly endeavored to lay down the duties of his office. He wrote valuable commentaries on the minor prophets and on the greater part of the New Testament. In addition he wrote 75 epistles and a number of tracts. His commentaries are founded on those of Chrysostom (q.v.). His exegesis is direct, precise, and textual in its treatment. His works were much esteemed by later writers. Maria de Rubeis published his works in Latin and Greek at Venice in 4 folio volumes (1754-63).

THE′OPOM′PUS (Lat., from Gk. Θεόπομπος) **OF CHIOS** (c.378-c.300 B.C.). A Greek historian. In early life he left home with his father, who was banished on account of his predilection for the Spartans, and took refuge in Athens. There he was trained in oratory by Isocrates. In addition to numerous panegyrics, of which that on Mausolus was the most celebrated, his works included Ἑλληνικαὶ ἱστορίαι or Σύνταξις Ἑλληνικῶν, a *History of Greece* in twelve books, embracing the period from B.C. 411, where Thucydides breaks off, to the battle of Cnidus, in 394; and Φιλιππικά in fifty-eight books, a history of the life and times of Philip of Macedon. Of these works only fragments remain, but an abridgment of the Latin translation of the φιλιππικά, by Trogus Pompeius, has been preserved by Justin. Though the ancient critics commend his accuracy, they blame Theopompus for the harshness and illiberality of his remarks. This, however, was due to his fearless exposition of the corruption among the politicians of his day. According to Pliny, he was the first Greek writer to make any definite mention of Rome. For the fragments, consult Müller, *Fragmenta Historiorum Græcorum* (Paris, 1841); Bünger, *Theopompea* (Strassburg, 1874).

THEOR′BO (It. *tiorbo*, of unknown etymology). An obsolete musical instrument of the lute family, of which it formed the bass. Besides having strings running over the fingerboard, it had a number of bass strings stretched alongside of the board. These strings were longer and were fastened in a separate neck attached to the neck containing the strings stopped by the fingers. The theorbo was an indispensable instrument in the orchestra of the seventeenth century and was especially used for accompanying the voice. For illustration, see Plate of MUSICAL INSTRUMENTS.

THEOREM (Lat. *theorema*, from Gk. θεώρημα, sight, principle considered, rule, theorem, from θεωρεῖν, *theōrein*, to view, from θεωρός, *theōros*, spectator, from θεᾶσθαι, *theasthai*, to view, behold). In mathematics, a proposition to be demonstrated. A theorem consists of two parts: the *hypothesis*, or the given, and the *conclusion*, or what is to be proved. One theorem is the *converse* of another when the conclusion and the hypothesis are interchanged in the two theorems. The converse of a theorem is, however, not necessarily true. A *corollary* (q.v.) of a theorem is a truth easily deduced from it and not requiring a separate demonstration. A lemma (q.v.) is generally a theorem used to prepare the way for another.

THEOSOPHICAL SOCIETY. A society founded by Helena Petrovna Blavatsky (q.v.) in New York, November 17, 1875, assisted by

Colonel Henry S. Olcott, William Q. Judge, and others. Its objects were: (1) To form the nucleus of a universal brotherhood of humanity; (2) to study and make known the ancient religions, philosophies, and sciences; (3) to investigate the laws of nature and to develop the divine powers latent in man. Blavatsky left New York, December 17, 1878, and went to India, accompanied by Colonel Olcott, where a system of propaganda was organized and numerous branches were formed. Judge remained in New York, and built up the society in the United States. He formed a strong branch, the Aryan Theosophical Society, in New York City, of which he was president. Madame Blavatsky left the Theosophical Society as an international body with headquarters at Adyar, India, and with three sections: the Indian, comprising the Orient; the English Section, having jurisdiction over Europe; and the American Section for America. Olcott, at Adyar, was president; Judge, at New York, vice-president. Each section had a general secretary—Bertram Keightley, of Adyar, of the Indian; G. R. S. Mead, of London, of the English; and Judge, of New York, of the American Section. There was an inner body, the Esoteric Section (E. S.), at the head of which was Madame Blavatsky. At her death she was succeeded by Judge and by Annie Besant, of London, jointly, both supposedly mouthpieces of an unknown master, the real head of the theosophical movement. Charges of fraudulent use of this master's name were preferred against Judge by Mrs. Besant. These charges, though never proved, caused a split between the supporters and opponents of Judge. In Boston, in April, 1895, the American Section almost unanimously declared its autonomy as the "Theosophical Society in America" (T. S. in A.), with Judge as president. It had about 150 branches in the United States with several thousand active members. In so far as these members belonged to the Esoteric Section, they recognized Judge as the outer head (the real head being the unknown master), and, following their example, those theosophists throughout the world who believed the charges false formed independent bodies in their separate countries, called respectively the Theosophical Society in England (T. S. in E.), in Sweden (T. S. in S.), in Australia, etc.

The society under Olcott kept up its organization, though the English and American sections were much weakened. Mrs. Besant remained the head of that Esoteric Section which was connected with the society under Olcott. Judge died March 19, 1896, leaving his society in a flourishing condition, but with no successor as head of the Esoteric Section, or the T. S. in A. Katherine A. Tingley then obtained recognition, first from a few members, and through skillful advances from the bulk of the society, as the successor of Blavatsky and of Judge, and as the leader of the theosophical movement throughout the world. Many members at once left the T. S. in A., and more dropped out as she gradually changed the policy of the society. At a convention in Chicago, in February, 1898, she formed "The Universal Brotherhood Organization," of which she was the absolute ruler, and the possessor of all its property. Of the remnants of the T. S. in A. she made a literary department of her "Universal Brotherhood." The headquarters in New York City were abandoned and she took her remaining followers, not more than a dozen of the old members of the T. S. in A., to Point Loma, near San Diego, Cal., where she formed a colony. Mrs. Tingley caused the life of the branches of the T. S. in A. to become gradually extinct. A few members exist here and there, but are not active. The theosophical movement continues, however, on the one hand as the organization under Olcott, as president, and on the other, under the form of independent local societies, recognized as theosophical by their adherence to the three objects of the society founded by Madame Blavatsky. The most active of these independent societies is called "The Theosophical Society, New York," and has existed since 1898.

THEOSOPHY (Gk. *θεοσοφία*, *theosophia*, wisdom in divine things, knowledge concerning God, from *θεοσόφος*, *theosophos*, wise concerning God, from *θεός*, *theos*, god + *σοφός*, *sophos*, wise). A term used to denote a system or systems of philosophy based on an inwardly revealed and mystic knowledge of God and the laws of the universe, giving a supersensual insight into their operations. The belief in revelations of this type is of course far anterior to the term theosophy, which has been applied to cults of varying tenets and diverse uses of the concepts of divinity at different periods. The ancient systems of belief falling under this head may be divided roughly into Oriental and Occidental, the former being the older. The earliest traces of theosophic thought are found in the Sanskrit Upanishads (q.v.), which represent a revulsion from the ritualism of the Vedas (q.v.) and the Brahmanas (q.v.) to mystic meditation on the nature of the All-Soul or Atman. It is in a sense true that all subsequent Hindu philosophy is theosophic. From India this mystical speculation spread to Persia, and from the Persians it was absorbed by the Arabs after their conquest of Iran. In a somewhat similar sense the *Yi-King* and the *Tao-teh-King* of China and the Egyptian *Book of the Dead* may be regarded as theosophic.

Among the Jews a theosophy whose origin was somewhat analogous to that of the Indian system arose about the beginning of the Christian Era, and attained wide currency in Europe between the twelfth and sixteenth centuries. The teachings of the Cabbala (q.v.) as represented in the writings of Simeon ben Jochai and Moses de Leon, however, are so widely different from the theosophy of India as to preclude any idea of Hindu influence. On the other hand, the Cabbalistic doctrines were profoundly modified by what may be regarded as the typical Occidental theosophy, Neo-Platonism (q.v.), represented by Ammonius Saccas, Plotinus, Porphyrius, and Proclus, and by the Gnostics, represented by Valentinus and Basilides. In the Middle Ages theosophy was taught by Tauler, Eckhardt, Paracelsus, Van Helmont, Robert Fludd, Thomas Vaughan, Heinrich Kunrath, Jakob Boehme, Johann Georg Gichtel, and later by Count Saint Martin. At different periods in history men appeared, teaching the immortality of the soul, and the existence of a vast cosmos, moved by occult forces, of which cosmos this earth is but an infinitesimal part. They showed the instability of material existence, the reality of an occult world which reaches everywhere into ours.

In modern times, the name theosophy has been given to a form of belief promulgated by a Russian, Madame Blavatsky (q.v.), who gave out such doctrines concerning cosmogony and anthropology, and who made such claims as to the source of her instructions, which, she said, were obtained from certain Masters, that 'theosophy' now connotes the cult established by her. The authoritative work on modern theosophy is her book, *The Secret Doctrine,* which states "the three fundamental propositions" as follows: (1) An omnipresent, eternal, boundless, and immutable principle on which all speculation is impossible, since it transcends the power of human conception and could only be dwarfed by any human expression or similitude. (2) The eternity of the universe in toto as a boundless plane, periodically the playground of numberless universes incessantly manifesting and disappearing—the law of periodicity. (3) The fundamental identity of all souls with the universal Over-Soul, the latter being itself an aspect of the unknown Root; and the obligatory pilgrimage of every soul—a part of the Over-Soul—through the cycle of incarnation in accordance with cyclic and karmic law, during the whole term. The esoteric philosophy admits of no privileges or special gifts in man save those won by his own Ego through personal effort and merit throughout a long series of reincarnations.

According to theosophic teaching, God is said to be infinite and absolute. Therefore, no attempt is made to qualify or describe the Great Unknown; but the manifested universe is traced back from the material world, through the powers of nature, to the Logos, from which all manifestation begins. Evolution is accepted, but as only half a law. The other half is involution. Spirit and matter are the two aspects of one root-nature. According to immutable law, the spirit involves into matter and matter evolves the spirit. Thus there is a circulation downward and upward, from spirit into matter and from matter to spirit.

All worlds pass through seven great periods of manifestations called Rounds. Spiritual at first, they become denser and darker in the downward cycle, the fourth of which is the densest and our present material world. Thence begins its upward movement toward spirituality. The advantage gained is the experience and ultimately the emancipation of the soul. In each of these rounds, periods of incalculable duration, there are seven great root-races. Each root-race has seven sub-divisions or sub-races corresponding with the rounds, which become more material from the first to the fourth. We are at present in the fifth sub-race of the fifth root-race, and on the upward cycle of the fourth round. Evolution is constant progress, an unfolding of consciousness from the most primitive forms of life to the highest intelligence.

Humanity is one great family. All souls are the same in essence, but they differ in degrees of development; each bears a certain relation to the others and to the whole. The apparent separateness of beings is overcome by the experiences of its involution and evolution. The more advanced souls are the natural guardians of the less developed. Man is composed of seven principles, which are divided into a lower or mortal, and a higher or immortal nature. The lower nature, constituting his personality, is fourfold. One-fourth, the physical body, is visible, three-fourths invisible. These three are the astral or design body (*linga śarīra*), on which are molded the physical atoms, then the life principle, and the principle of desire. The physical body (*sthūla śarīra*) is material without form. It is held in form by the astral body, and moved to action by the fire of desire (*kāma*). This fourfold nature is common to all animal beings, is mortal and subject to dissolution at death. The higher nature of man is threefold, the mind (*manas*), soul (*buddhi*), and spirit (*ātman*). The mind distinguishes man from the animal. It makes him appear to be separate from others by his self-consciousness. Entering the animal body, the mind thinks of itself as separate from others. The soul is universal, overcoming separateness and showing relationship of soul with soul. The spirit is the one indivisible which passes through all things and unites them with each other. Death is the separation of the principles. The physical body returns to the elements which gave it. The astral body disintegrates more slowly. The life (*prāṇa*) passes at once into the universal life (*jīva*). Desire forms itself into a body (*kāma-rūpa*) which gradually becomes exhausted, leaving seeds (*skandhas*), from which the returning soul forms a later and new personality.

The trinity of mind, soul, and spirit, when freed from the trammels of a mortal garment, passes through certain states of consciousness until it reaches the condition called heaven (*dēvacāna*), where it enjoys a period of bliss and rest proportionate to its good thoughts and ideals while on earth. When these exalted ideals have been exhausted, its period of rest is at an end and it descends gradually to earth. The trinity, after enjoying its rest, and realizing those ideals which could not be attained on earth, is attracted again to earth by the unfulfilled longings and desires which remain behind as seeds. These it animates. It sinks into the emotional world, is attracted to a particular family, who can furnish a body and surroundings suited to its new experience, and is reborn into this world. The higher nature must become consciously immortal, that is to say, it must acquire a continuity of consciousness, thus making it consciously immortal while in the physical body. One earth-life is not sufficient. Hence rebirth into the school of life is the lot of the soul until all the lessons have been learned. This doctrine is closely associated with that of Karma, which is the law of balance, of action and reaction, of effect inevitably connected with the preceding cause. Applied to man, it is a moral law of unerring justice, and to it all other laws, physical and otherwise, are subservient. It returns to man measure for measure his good or evil thoughts and deeds. It is inseparable from reincarnation. Man has his Karma in his duties. It is by performing every duty willingly that Karma is exhausted. If one evades the duty of the moment, Karma will ultimately compel him to perform that which is the outcome of his past thoughts and acts. Karma is the cause, reincarnation the effect. Karma is the action and interaction between desire and mind.

The phenomenon of life is a question of planes or states of consciousness. Consciousness is one, but matter is of seven grades or states. Consciousness of matter is the result of an evolution independent of it, which endows it with a consciousness of each of the seven planes or states on which that matter is manifested. Consciousness remains the same in all planes. The seven states of consciousness are: Elemental, or atomic (*prakṛti*), which is a simple consciousness of the elements of matter. Mineral or molecular consciousness (*linga śarira*) is the consolidating of the elements into form according to a definite principle of design. Vegetable or cellular consciousness (*prāṇa*) is a recombining of that matter through growth and expansion by the principle of life. Animal or organic consciousness (*kāma*) is the directing of the life of matter and design by the principle of desire. Human or 'I—am—I' consciousness (*manas*) is the self-identifying of the consciousness, as being distinct and separate from others by the intelligent principle of mind. At this point a man may rise to the divine or sink below the consciousness of the brute—at will. Universal or 'I am thee and thou art I' consciousness (*buddhi*) is the relating of the elements and of all souls with each other, thus overcoming the sense of separateness of the mind by the principle of the divine soul. Divine consciousness (*ātman*) sees no separateness but unites all as one.

Hell (*avīci*) is a low and depraved condition on this earth. A life of intense selfishness and wickedness with no spiritual thoughts or aspirations causes the immortal soul to abandon the body before death. In such a case, it is not, however, the soul, but the body with the lower principles which is lost. After the death of such a body the desires with a reflection of the mind may be reincarnated in human form almost immediately. Such a creature is entirely material and animal, intensely selfish in its propensities, and doomed to final destruction, unless it makes a strong appeal to its divine soul, in which event the soul might again connect with it and try to help it on its upward path.

In man divine powers are latent, for he is essentially a soul, a divine being. He has within his personality the potential powers of a God. By purification and training of the body, the latent and divine powers will develop and become active. In every period of evolution a number of souls reach perfection. They are men whom the bonds of personality no longer bind to the attractions of the senses. They have consciously related themselves to the source of their being and have become one with the divine. They watch over humanity and are its guardians. Although they have earned their freedom from rebirth, they prefer to remain in contact with men on earth, to teach and to guide them. At certain periods some appear among men as great law-givers, rulers, teachers, and their agents found religious systems and schools of philosophy.

Consult: Blavatsky, *The Secret Doctrine* (2 vols., London, 1888); id., *Isis Unveiled* (2 vols., New York, 1877); id., *Key to Theosophy* (London, 1891); id., *Voice of the Silence* (ib., 1891); Judge, *Echoes from the Orient* (New York, 1890); id., *The Ocean of Theosophy* (1893); Sinnett, *Esoteric Buddhism* (Boston, 1884); id., *The Occult World* (ib., 1885); id., *Growth of the Soul* (London, 1896); Besant, *Theosophical Manuals* (ib., 1893); id., *The Ancient Wisdom* (ib., 1899); id., *Esoteric Christianity* (New York, 1901); Anderson, *Reincarnation* (San Francisco, 1896); id., *Septennary Man* (ib., 1895); Walker, *Reincarnation* (New York, 1888); Hartmann, *Magic Black and White* (ib., 1890); id., *Paracelsus* (ib., 1891); Collins, *Light on the Path* (ib., 1897); id., *Idyl of the White Lotus* (ib., 1890); id., *Through the Gates of Gold* (Boston, 1887).

THEOTOCOPULI, tā-ō'tō-kō-pōō'lē, DOMENICO (c.1548-1625). An Italian painter, engraver, architect, and sculptor, known as Il Greco, born probably in Crete, and supposed pupil of Titian. His early life is surrounded by uncertainty and the first undoubted fact relative to him is that he was residing at Toledo, Spain, in 1577, when he began to paint for the Cathedral "The Parting of Christ's Raiments." In his quality of architect he designed and carved the retable in which the picture was hung and for which he was paid 182 ducats more than for the picture itself. Summoned to Madrid by Philip II., he executed altarpieces for the Escorial, in which he attempted to adopt a style which should be distinctively his own, but failed entirely. His best work is the "Burial of the Count of Orgaz in 1323" (1534), in Santo Tomé, Toledo, containing many portraits of contemporary great personages. Other fine specimens of his ability as a portrait painter are in the Madrid Museum, which also contains a "Dead Christ" and several biblical scenes; and a portrait of himself and one of his daughter are in the Louvre. The National Gallery, London, possesses a "Saint Jerome" and the Dresden Gallery the "Healing of the Blind." As an architect and sculptor, Il Greco attained considerable reputation and designed several churches and admirable monuments. His most important structure was the church and monastery of the Bernardine monks at San Domenico di Silvos, of which he executed the whole—architecture, sculpture, and painting.

THE'RA. The ancient name of Santorin (q.v.), one of the Cyclades. The chief town is Thera.

THERAMENES, thē-răm'ē-nēz (Lat., from Gk. Θηραμένης) (?-404 B.C.). An Athenian politician. In B.C. 411 he was a leading member of the oligarchy of the Four Hundred at Athens, but soon, going over to the opposition, took a leading part in the deposition of that body. In B.C. 410 he took part in the battle of Cyzicus, and in B.C. 408 was present at the siege of Chalcedon and the capture of Byzantium. At the battle of Arginusæ, B.C. 406, he was one of the subordinate officers in the Athenian fleet, and after the battle was ordered to return to the spot where the action had taken place and rescue such of the disabled ships and their crews as he could. A severe storm having intervened, he found it all but impossible to execute this order, and as a result a large number of Athenian citizens were drowned. Then, anticipating the wrath of the people, he hastened to Athens and accused the commanders-in-chief of negligence. When, in B.C. 404, Athens was besieged by the Lacedæmonians, Theramenes was sent to Lysander to arrange a peace, but, after remaining in Lysander's quarters more than three months, until the Athenians were reduced to such a state of suffering that they were ready to submit to any terms, he returned to report that he could accomplish nothing, but that an embassy must be sent to the Spartan ephors. Being a second time sent forth, this time to Sparta, he concluded a peace unfavorable to the Athenians. He was chosen one of the Thirty Tyrants who were set up at Athens, but, taking sides against the more violent members of that body, he was accused by Critias of being a traitor and was put to death. Consult Pöhlig, *Der Athener Theramenes* (Leipzig, 1877).

THERAPEUTÆ (Neo-Lat. nom. pl., from Gk. *θεραπεύτης*, *therapeutēs*, attendant, servant, from *θεραπεύειν*, *therapeucin*, to attend, from *θεράπων*, *therapōn*, attendant; connected with Lat. *firmus*, strong, Skt. *dhar*, to hold). The name given to an ascetic sect in a Greek treatise *On the Contemplative Life or the True Virtues*, which on the basis of Eusebius's testimony (*Hist. Eccles.* ii. 16, 17) has been attributed to Philo Judæus. It is thought by some scholars to belong to the close of the third century and to describe, not a Jewish sect, but Christian monks living in Egypt. On this theory the author, a Christian who flourished shortly before the days of Eusebius, wrote the treatise as a panegyric on asceticism. He uses as illustrations the customs prevailing in his days among ascetics and more particularly in his own country, Egypt, and in order to add weight to his utterances he puts his treatise under the name of Philo. Conybeare, Wendland, and others maintain the genuineness of the work. The Therapeutæ are described as living chiefly on the lake Marcotis, near Alexandria, and having also numerous colonies in other parts of the world. Consult: Lucius, *Die Therapeuten und ihre Stellung in der Geschichte der Askese* (Strassburg, 1880); Conybeare, *Philo, About the Contemplative Life* (Oxford, 1895); Wendland, *Die Therapeuten* (Leipzig, 1896).

THERAPEUTICS (from Gk. *θεραπευτικός*, *therapeutikos*, relating to medical treatment, from *θεραπευτής*, *therapeutēs*, attendant, servant). The branch of medicine which has as its object the cure of disease. The conception of disease which is found among primitive races is associated with the idea of demon possession. The earliest therapeutic measures were devoted to driving out these demons from the bodies of their victims. Two methods were employed: one consisted in the recital of charms or magic over the ailing part, or over the sick person; and the other consisted in the internal administration or the external application of certain aromatic or bitter herbs. In the early history of both Eastern and Western nations there was a blending of the office of priest and physician. Among the ancient Egyptians the treatment of disease had acquired a character which was by no means unscientific. They used many remedies of vegetable, mineral, and animal nature, a number of which are of acknowledged value. Careful directions are to be found as to the administration of drugs as well as the indications for their use. Egyptian physicians' knowledge of hydrotherapy, dietetics, and hygiene was far advanced. Among the Hebrews the infliction and cure of diseases is on various occasions in Scripture ascribed to the direct interposition of God. Their methods of treatment consisted principally of strict hygienic means, careful attention to diet, ablution, separation, and combustion of infected garments. A large list of remedies is mentioned in the Bible. The Babylonians had no practitioners of medicine; they exposed their sick in public places in order that travelers might communicate their experiences as to the best mode of cure. In Assyria the sick were similarly exposed, and purges, emetics, and blisters were employed as matters of routine for three days successively each month. We know also that they used salt and alum, as well as fumigations with mixtures of various drugs. The Chinese assert that with them the study of medicine was coeval with the foundation of their empire. They possess extensive works on treatment which are of great antiquity. Ginseng they regarded as a panacea, and also employed opium, mercury, and a number of other drugs of value. The Greeks may have borrowed something from the Eastern nations of their knowledge of medicine and treatment; but researches have shown that under the scientific spirit of Hippocrates they had evolved a system which commands respect. Hippocrates ascribed disease to alterations of the humors of the body (the blood, phlegm, and yellow and black bile). He employed baths, diet, exercise, blood-letting, the actual cautery, and other surgical means, and also an extensive series of medicines derived from mineral, vegetable, and animal sources. The Alexandrian School, which succeeded the Hippocratean, opposed bleeding and returned to simple remedies. This sect was followed by the Empiricists, who followed experience as their sole guide. Then came the Methodic School, which rejected all previous theories and explained all normal and abnormal processes by the contraction and relaxation of the pores of the body. They regarded all medicines as possessing astringent or relaxant qualities, and their choice of remedies depended upon which effect upon the pores they aimed to secure. Galen represented the highest development of Greek medicine. He explained the operation of drugs by reference to their elementary qualities, heat, cold, dryness, and moisture. In the early periods of Roman history medicine was practiced by the slaves and freedmen and its highest development was reached under the influence of the Greek School. In the Dark Ages medicine was practiced by the monks. Magic and astrology were potent influences. During this time the doctrine of 'signatures' arose. According to this idea a remedy was chosen on account of its fancied resemblance in form or color to the organ affected. To this doctrine we trace the introduction into medicine of such drugs as the bloodroot and liverwort. The old Galenists used only organic drugs, but in the fifteenth century under Paracelsus and his followers there was an overthrow of the older methods. He first introduced chemical agents (employing mercury in syphilis) and substituted tinctures, essences, and extracts for various disgusting preparations. Toward the middle of the eighteenth century the practice of therapeutics had reached a most complicated stage. There were theories and counter-theories and physicians were prescribing huge doses of unpleasant mixtures in the hope of securing the good from all the remedies recommended. A natural reaction set in which resulted in the establishment of homœopathy, an outgrowth of the reactionary doctrine of 'vitalism.' Later there arose the therapeutic nihilists, prominent among whom were Van Swieten and Skoda. This school rejected drug treatment altogether.

Modern therapeutics may be said to have begun with the discovery of morphine, an alkaloid of opium, in 1817. The present method of treatment is embodied in rational therapeutics, which implies the use of remedies based on a knowledge of the diseased condition present in the patient, a knowledge of the nature of disease itself, and of the physiological action of the agent employed, as determined by experimental investigation on animals, from which may be deduced the action on men. The knowledge of the action of drugs must include the manner in which they affect the nerve centres, the respiration, the circulation, and especially their influence on blood pressure, and on body temperature. The range of medicinal dosage, as well as the minimum and maximum fatal dosage, must also be determined. In treating disease it is the aim of the physician to seek the cause of the condition present and to endeavor from a true appreciation of the knowledge of drug action to administer such remedies as will effect a cure. A remedy which possesses the influence of curing positively a certain disease is called a specific. Such is the action of mercury in syphilis and quinine in malaria. Empirical therapeutics was based on the cumulative evidence that certain drugs were of service in certain conditions, and experiment was the sure guide. Symptomatic treatment aims to relieve the symptoms of disease irrespective of their cause. Rational or scientific therapeutics recognizes that both these previous methods may have to be followed at times, but it aims especially at the removal of the cause of disease by appropriate treatment of whatever sort. It has been developed by the increased knowledge of disease which we have acquired through the growth of the sciences of pathology and bacteriology. *Materia medica* comprises a knowledge of the remedies employed in medicine; while the methods by which drugs are prepared and combined for administration, as well as the separation of the active principles of drugs, belongs to the department of therapeutics known as pharmacy. It is essential that there should be a uniform standard of strength and purity of medicinal products, as well as uniformity in their preparation, and to attain this object the various countries have standards established by law or by professional authority, to which the drugs prepared by the pharmacists must conform. These standards are published by each nation in works known as Pharmacopœias. The first United States Pharmacopœia was published in 1820, previous to which time European works were mainly used as authorities. This work is revised every ten years by a committee of physicians and pharmacists. Those preparations which follow its direction and are named in the work are called *official. Unofficial preparations,* including many newer drugs, are in use. The best of these are finally included in the Pharmacopœia, provided they are regarded of sufficient value. The term therapeutics is usually restricted to the administration of medicinal drugs, but in its broadest sense, general therapeutics, it includes every form of treatment. Natural therapeutics is the healing power of nature to cure disease through the operation of the so-called *vis medicatrix naturæ.* In what is known as expectant treatment the physician depends solely on this force and sustains the patient's strength by food and nursing. Treatment by surgical means is regarded as a special and separate department of medicine. A large number of other means than treatment by drugs is in use and each is designated by an appropriate prefix. Electrotherapeutics, the use of electricity as a healing agent, is especially valuable in certain cases of disease of the nervous system or local injury to a nerve. By this means the nutrition of paralyzed muscles may be maintained by electrical stimulation until the nerve is in a condition to resume its function. Radiotherapy or X-ray therapy is the use of the Roentgen rays for the purpose of treatment. Hydrotherapy is the treatment of disease by the application of water, either as baths of various temperatures (balneotherapeutics) or by drinking, douching, spraying, etc. Suggestive therapeutics is the name given to treatment in the form of suggestion made to the patient while in an induced hypnotic state, with the object of the patient's following the suggestion when awakened from the hypnotic sleep. This treatment is of limited utility in a few varieties of nervous disease of so-called functional origin, in which no organic disease exists. Climato-therapeutics is the utilization of certain locations on account of their peculiar adaptability to the patient's condition; as the sending of patients suffering with consumption to high altitudes and dry climates. Therapeutics fully recognizes the value of diet in disease in an important department of the subject known as dietetics or dieto-therapeutics. The use of extracts of various glands of the body, especially of the thyroid and the suprarenal glands, has of late been attracting considerable attention. This department of therapeutics is called opo-therapy and promises wide usefulness. Massage and various allied measures have a prominent place in the treatment of certain conditions and assist in sustaining the nutrition of the muscles. This is sometimes called masso-therapeutics.

There have been a number of methods of classifying remedies followed by various authorities, but none of these is entirely satisfactory. The most important are: (1) the botanical method, which groups the vegetable remedies according to the botanical classifications; and (2) the arrangement according to the therapeutic action of drugs. Many drugs, however, are used for a number of purposes, and it is undesirable to describe them under more than one heading. Finally, there is (3) the pharmacological classification, which arranges drugs according to their action on living matter. This method does not take into account the chemical composition or therapeutic action of drugs, but those having the most characteristics in common are placed together. The groups are named for the most prominent member or from some marked property possessed by all. The chief divisions, under which are included many sub-groups, are thus stated by Cushny: (1) Organic substances which are characterized chiefly by their local action, such as pepper, mustard, and turpentine. (2) Organic substances characterized chiefly by their action after absorption, such as alcohol, strychnine, and morphine. (3) The alkalies, alkaline earths, acids, and allied bodies. Under this head are grouped the various salts of ammonia, etc. There is a gradual transition from this group to (4) the heavy metals, as silver, gold, iron, etc. Another class (5) embraces ferments, secretions, and toxalbumins, thus consisting of a number of substances which are either present in the normal body or are merely substitutes for normal secretions. In the last group (6) menstrua and mechanical remedies are found, preparations which are used only for their mechanical effects, and which, while they are included in the Pharmacopœia, are not for the most part drugs.

THERE'SA, Saint. See Teresa.

THERESINA, tā'rē-zē'nȧ, or **THEREZINA.** The capital town of the State of Piauhy, Brazil, on the right bank of the river Paranahiba, 230 miles from the city of that name at its mouth (Map: Brazil, J 5). The town is regular in construction, but uninteresting and unhealthful. Population, about 6500.

THERESIOPEL, tā-rā'zē-ō'p'l, or Maria-Theresiopel (Hung. *Szabadka*). A royal free city of the County of Bács, Hungary, 109 miles by rail south-southeast of Budapest (Map: Hungary, F 3). It is a scattered town, lying in a great, rich plain between the Danube and the Theiss, and has noteworthy churches. Theresiopel is the centre of a fine large corn-raising district, which also produces tobacco. The manufactures include linens and shoes. The town has a fine trade in grain, wine, horses, cattle, hogs, hides, and wool. Population, in 1890, 73,526; in 1900, 82,122, chiefly Catholic Magyars and Serbs.

THER'IDI'IDÆ (Neo-Lat. nom. pl., from Gk. *θερίδιον*, *theridion*, diminutive of *θήρ*, *thēr*, wild beast). A family of spiders known as the cobweb-weavers. These are small spiders with very slim legs, and include most of the familiar house spiders. They are generally soft and of a light color, with the abdomen large and round and the legs lacking in spines. The eyes are all of about the same size and are placed in two rows across the front of the head. The mandibles are weak and without teeth at the end. The maxillæ are pointed at the end and turn inward toward each other. The family is one of the largest of the order Arachnida. Many species of Theridiidæ spin their webs in the fields on bushes. The web is a flat or curved sheet, supported by threads which run in many directions, under which the spider hangs head downward. The egg cocoons are round and soft and hang in the web.

THE'RIODON'TA (Neo-Lat. nom. pl., from Gk. *θηρίον*, *thērion*, diminutive of *θήρ*, *thēr*, wild beast + *ὀδούς*, *odous*, tooth). A suborder of extinct Permian and Triassic reptiles, the skulls of which show remarkable resemblance to those primitive carnivorous mammals. See Cynognathus; Theromorpha; Reptile.

THE'RIOSU'CHUS (Neo-Lat., from Gk. *θηρίον*, *thērion*, diminutive of *θήρ*, *thēr*, wild beast + *σοῦχος*, *souchos*, crocodile). An extinct crocodile with body less than two feet long, skeletons of which are found in the Purbeck beds of the English Upper Jurassic. See Crocodile; Teleosaurus.

THERMAL SPRING (from Gk. *θέρμη*, *thermē*, heat, from *θερμός*, *thermos*, hot). A spring whose temperature is higher than the average temperature of the locality in which it emerges. The temperature may vary therefore from a minimum of a few degrees above the freezing point, which, however, is limited to thermal springs in high altitudes or great elevations, to a maximum represented by the boiling point of water under the local conditions. When the temperature reaches the latter limit the flow of the spring may take the form of periodical eruptions; a thermal spring of this character being known as a geyser (q.v.). The higher temperature of thermal springs as compared with ordinary springs may be caused by volcanic agencies or by the circulation of the waters at great depths in the earth's crust previous to emergence. The hottest springs are usually found in volcanic regions, and their high temperature is due to coming in contact with uncooled lava, which when buried at some depth retains its heat for a long time. It seems probable, also, that some springs are heated by gaseous emanations from the earth's interior, or, indeed, receive material contributions from that source. Thermal springs are quite common, however, in districts that have been free from volcanic disturbances, at least since remote geological times. The increase in temperature under such conditions can best be explained by peculiarities of geological structure which permit the surface waters to descend to great depths when they are heated and thence are returned to the surface under the influence of hydrostatic pressure. See Spring.

THERMES, târm (Fr., from Lat. *thermæ*, warm baths). The only remains of the Roman palace which occupied the site of the present Hôtel de Cluny, Paris. The ruins are those of the great baths connected with the palace, and include a frigidarium 65 feet long and 59 feet high, still uninjured, although up to 1820 it had long borne the weight of a garden laid out over it. The ships' prows of the vaulting are said to be the origin of the arms of Paris. A collection of Roman antiquities discovered in Paris is preserved in the hall.

THERMIC FEVER. See Heat-Stroke.

THERMIDOR, *Fr. pron.* târ'mē'dôr' (Fr., from Gk. *θέρμη*, *thermē*, heat + *δῶρον*, *dōron*, gift). The eleventh month in the French revolutionary calendar. It extended from July 19th to August 18th in the years I.-VII. and from July 20th to August 19th in the years VIII.-XIII. The 9th Thermidor of the year II. (July 27, 1794) is historically memorable as the date of Robespierre's fall and the termination of the Reign of Terror. The name Thermidorians was given to all those who took part in this coup d'état, but more particularly to those who were desirous of restoring the monarchy. See French Revolution; Robespierre.

THERMO-CHEMISTRY. The branch of general chemistry that deals with the thermal phenomena accompanying chemical transformations. While those phenomena are caused partly by the chemical changes proper, they may be due in part also to the purely physical changes of state that often accompany chemical reactions; and for this reason the scope of thermo-chemistry must extend over physical as well as chemical changes of matter. For the principles of thermo-chemical notation, see **CHEMISTRY**, section on *Transformations*.

What has thus far been accomplished in the domain of thermo-chemistry may be summed up as follows: First, a large number of transformations have been subjected to calorimetric measurement, and so the total amounts of heat given off or absorbed during a great many changes have been determined experimentally; secondly, the principles of thermodynamics have been successfully applied to the consideration of chemical changes, and thus thermo-chemistry has been highly developed theoretically.

EXPERIMENTAL THERMO-CHEMISTRY. The actual execution of thermo-chemical measurements is a matter of some difficulty, owing to the considerable errors that may be caused by more or less heat being lost by radiation while the measurement is being carried out. The heat given off or absorbed is determined by keeping the vessel in which the reaction takes place immersed in a known quantity of water, and observing the temperature of the latter before and after the reaction. But whatever the details of such a 'calorimetric' arrangement may be, whatever the precautions taken to isolate the calorimeter from its surroundings, the loss of heat during an experiment would render the observation worthless in every case in which the chemical change studied would take place slowly. In consequence of this, thermo-chemical knowledge would necessarily be confined to rapid reactions alone, if it were not for the fact that early in the history of thermo-chemistry a principle became known that permitted of ascertaining the heat of slow reactions, too, by indirect methods. The principle in question is known as *the law of constant heat-sums.* While clearly established by Hess in 1844, i.e. before the law of the conservation of energy became known, it is nothing but a special form of the law of conservation. It is as follows: *The amount of heat given off or taken up when a given chemical system is changed into another is the same whatever the way in which the change may take place.* Let, for example, the given chemical system consist of 17 grams of gaseous ammonia in one vessel, its equivalent 36.5 grams of gaseous hydrochloric acid in another vessel, and a large quantity of water. This system may be changed into a dilute aqueous solution of ammonium chloride in two different ways: (1) ammonia and hydrochloric acid may be caused to combine in the gaseous state, yielding solid ammonium chloride and *developing* 42,100 calories of heat; then the ammonium chloride may be dissolved in the water—a change accompanied by the *absorption* of 3900 calories; or (2) the gaseous ammonia may be dissolved in a large amount of water—a process *developing* 8400 calories; the gaseous hydrochloric acid may be dissolved in a separate large quantity of water—a process *developing* 17,300 calories; and, finally, the dilute aqueous ammonia may be mixed with the dilute aqueous hydrochloric acid—a process *developing* 12,300 calories. Whichever the way adopted, the result is the same—viz. a dilute aqueous solution of ammonium chloride. The heat developed when the first way is adopted is $42{,}100-3900=38{,}200$ calories; the heat developed when the second way is adopted is $8400+17{,}300+12{,}300=38{,}000$ calories. The figures 38,200 and 38,000, differing by only 2 parts in 382 (little more than $\frac{1}{2}$ per cent.), i.e. by less than the unavoidable experimental error, must be considered as equal—which is in accordance with the law of constant heat sums. If, for some reason, it were impossible directly to measure, say, the heat produced by the combination of gaseous ammonia and gaseous hydrochloric acid, that heat might be calculated, according to the law of constant heat-sums, by adding 3900 calories (the heat absorbed when one equivalent of ammonium chloride is dissolved in much water) and 38,000 calories (the total heat produced during the transformation, by the second way, of gaseous ammonia and hydrochloric acid into dilute ammonium chloride). The sum, 41,900 calories, would be as near the truth as the 42,100 calories found by direct experiment. To take another, even simpler example, suppose it were asked, How much heat would be evolved or absorbed in the transformation of 12 grams of amorphous carbon into diamond? The transformation, although accomplished on a minute scale by Moissan, in his electric furnace, is of course inaccessible to direct calorimetric measurement. But the law of constant heat-sums permits of answering the question by measuring the heat of combustion of amorphous carbon and that of diamond. The transformation of amorphous carbon into carbon dioxide, whether accomplished by direct combustion or by first changing the carbon to diamond and then burning the latter, must be accompanied by the evolution of the same amount of heat, viz. 97.650 calories; and as the heat of combustion of diamond is 94,310 calories, the transformation of amorphous carbon (12 grams) into diamond must, according to the law of constant heat-sums, be accompanied by the evolution of $97{,}650-94{,}310=3340$ calories.

In a similar manner Hess's law permits of ascertaining the heat that would be developed during the formation of compounds (e.g. the majority of organic compounds) whose formation from the elements could not be directly studied calorimetrically. Let it be required, for instance, to ascertain the heat that would be developed or absorbed if ordinary alcohol (C_2H_6O) were made from its elements—carbon (in the form of diamond), hydrogen, and oxygen. To do this, we may determine calorimetrically the heat (call it a) developed by the *combustion* of one gram-molecule of alcohol and the heats of combustion (b and c) of quantities of isolated carbon (diamond) and hydrogen equal to those contained in one gram-molecule of alcohol. The three combustions may be represented by the following equations:

$$C_2H_5OH + 6O = 2CO_2 + 3H_2O + a \text{ calories};$$
$$2C + 4O = 2CO_2 + b \text{ calories};$$
$$3H_2 + 3O = 3H_2O + c \text{ calories}.$$

Adding the second and third equations, we get:

$$2C + 3H_2 + 7O = 2CO_2 + 3H_2O + b + c,$$

and subtracting the first equation from this, we get:

$$2C + 3H_2 + O - C_2H_5OH = b + c - a,$$

or $$2C + 3H_2 + O = C_2H_5OH + b + c - a.$$

This last equation, expressed in words, means that if carbon, hydrogen, and oxygen combined to form ordinary alcohol, an amount of heat would be formed equal to the heat of combustion of the isolated elements of alcohol *minus* the heat of combustion of alcohol itself; *b*, the heat of combustion of two atoms (i.e. twice 12 grams) of carbons, is found to be 94,300 × 2 = 188,600 calories; *c*, the heat of combustion of three molecules (i.e. 3 × 2 grams) of hydrogen, is found to be 67,500 × 3 = 202,500 calories; finally, *a*, the heat of combustion of one molecule (46 grams) of alcohol, is found to be 340,000 calories. Hence, $b + c - a$, the heat of formation of alcohol, is 188,600 + 202,500 − 340,000 = 51,100 calories. See COMBUSTION.

THEORETICAL THERMO-CHEMISTRY. This, as already stated above, consists in the application of the principles of thermodynamics to chemical phenomena. The subject, if not very difficult, requires a working knowledge of the higher mathematics and thermodynamics, and can therefore be discussed here only in its more elementary aspects. The principal questions to which thermodynamics have been applied concern: (1) the influence of temperature upon the total energy-change (*Wärmetönung*) of reactions, i.e. heat given off or absorbed, no mechanical work being performed; (2) the influence of temperature upon the velocity of reactions (see REACTION, CHEMICAL); (3) the influence of temperature on chemical equilibrium; (4) the determination of the maximum mechanical work that can be performed by the chemical energy of reactions. We will briefly consider these questions in their consecutive order.

With reference to the dependence of the energy-change of a reaction upon the temperature, the verdict of thermodynamics is, first of all, that in case the heat-capacity of the reacting substances is the same as that of the products of the reaction, the energy-change of the reaction does not vary with the temperature. This is generally the case when the reacting substances and the products of the reaction are all solids. Thus the combination of silver and solid iodine into silver iodide sets free practically the same amount of heat (about 14,000 calories), no matter at what temperature the combination is caused to take place. On the other hand, if a given reaction does cause a change in the heat-capacity, then, if t denotes the difference between two temperatures at which the reaction may take place, $u_1 - u_2$ the difference between the energy-change at the first and that at the second temperature, and c the difference between the heat-capacity of the reacting substances and that of the products of the reaction,

$$u_1 - u_2 = ct.$$

By measuring calorimetrically the heat-capacities in question and the energy-change of the reaction at some one temperature, it is therefore easy to calculate the energy-change of the reaction at any other temperature—a result of considerable importance, because direct calorimetric measurements of the energy-change can by no means be readily carried out at any desirable temperature.

As to the velocity of reactions (see REACTION, CHEMICAL), it is well known empirically that a relatively small rise of temperature often causes reactions to take place with great rapidity—sometimes with explosive violence. Usually a rise of 10° C. doubles or even trebles the velocity. In a perfectly general manner, however, the dependence of the velocity on temperature cannot as yet be formulated. As far as chemical knowledge goes at present, it seems probable that a law analogous to Ohm's law in electricity will some time be found to express the relation between the reaction-velocity, the chemical force causing the reaction, and the 'chemical resistance.' If chemists should succeed in working out a clear conception of the latter, in measuring it, and expressing quantitatively its variation with the temperature, then the problem of the dependence of reaction-velocity on temperature would be solved. But all this remains to be done; and chemists realize that it is not by any means an easy matter to do it; for 'chemical resistance,' and hence also the velocity of reactions, depend, besides the temperature, on a number of more or less accidental factors—on the accelerating influence of certain 'catalytic agents' (see CATALYTIC ACTION), on the retarding influence of certain other substances, indeed sometimes on the material of the vessel in which the reaction takes place. Under such circumstances, the field for the mathematical application of thermodynamical principles is naturally very limited. Nevertheless, Van 't Hoff has succeeded in showing that *in many cases* the dependence of reaction-velocity on the temperature can be expressed by simple equations of the following form:

$$\log k = -\frac{A}{T} + B,$$

an equation established by him by combining the principles of thermodynamics with experimental observations. In this equation k stands for the velocity at the instant when the product of the active masses equals unit; T stands for the absolute temperature (i.e. the centigrade temperature *plus* 273 degrees); and A and B are constants whose numerical values depend on the nature of the substances taking part in the reaction. If k is actually measured at only *two* different temperatures, and its two corresponding values (say k_1 and k_2), together with the two temperature numbers (say T_1 and T_2), are substituted in the above equation, we get:

$$\log k_1 = -\frac{A}{T_1} + B,$$
$$\log k_2 = -\frac{A}{T_2} + B,$$

two equations with two unknowns, A and B. Solving these equations, and substituting the resulting numerical values of A and B in the general equation given above, we obtain a general relation between k and T for the given reaction. In other words, we can readily calculate what may be termed 'the standard velocity' for any temperature whatever—the 'standard velocity' being the velocity at the instant the concentrations of the reacting substances are such that the product of their active masses equals unit. The law of chemical mass-action then permits of calculating the reaction-velocity for all other possible concentrations.

With reference to chemical equilibrium (see REACTION, CHEMICAL), thermodynamics, as Van 't Hoff has shown, permits of foreseeing the equilibrium of a reaction at some temperature

T_2, if the equilibrium at some given temperature T_1 and the average of the energy-changes (heats given off or taken up by the reaction) at the two temperatures are known. In this manner it is possible to calculate, for instance, the degree of dissociation of ammonium chloride (see DECOMPOSITION; DISSOCIATION) at different temperatures, if the degree of dissociation at some one temperature, and the heat of dissociation, are known.

In connection with the influence of changes of temperature on chemical equilibrium, it is necessary to mention *Gibbs's phase rule*, which is of great importance in classifying the phenomena of equilibrium in material systems. By the 'phases' of a chemical system Gibbs means its several homogeneous parts that can be separated from one another mechanically. For instance, let water be shaken up in a bottle with ordinary ether, and three layers will form—a solution of ether in water, a solution of water in ether, and, over the liquid, a mixture of the vapors of water and ether; the three homogeneous layers can be separated by mechanical means, and hence they constitute the three 'phases' of the system. Since all gases and vapors form homogeneous mixtures, it is evident that no system can contain more than one gaseous phase. According to Gibbs's phase rule, n phases in equilibrium with one another cannot possibly be made up by less than $n-2$ independent chemical substances, or, what is the same, $n-2$ independent chemical substances cannot possibly form more than n phases in equilibrium with one another. When $n-2$ independent substances do form n phases, then the slightest change of temperature destroys the equilibrium, a transformation takes place, and one of the phases disappears. For instance, let $n-2=1$, and therefore $n=3$, as is the case at the melting-point of ice, when ice, liquid water, and water vapor may form three phases made up of a single chemical substance—water. As long as the temperature is constant, the three phases remain in equilibrium; let the temperature rise, and all the ice will have melted away; let the temperature fall, and all the water will have frozen. The melting-point of water is sometimes referred to as its *triple point*, because of the three phases which may exist in equilibrium at that point. Above and below that point, in the regions of the simultaneous existence of only two phases (liquid water and its vapor, or ice and its vapor), a change in temperature causes a corresponding *change* in the equilibrium, the vapor-tension, and hence the concentration of the gaseous phase varying with the temperature; but none of the phases necessarily disappears, i.e. the equilibrium of the several phases is not necessarily *destroyed*. In the case of ether and water forming three phases (see above), the number of independent substances being only one less than the number of phases, a change in temperature would likewise cause a change in equilibrium; but ordinarily none of the phases would necessarily disappear, i.e. again, the equilibrium would not necessarily be destroyed. If, however, the temperature should fall to the point at which water would begin to freeze out of the aqueous solution of ether, then a fourth phase (ice) would be added to the three phases of the system; the number of phases (4) would then exceed by two the number of independent substances (2, ether and water) composing them, and the equilibrium that would then ensue would be destroyed by the slightest variation of temperature from that 'quadruple point' (i.e. the point of four phases) of the system. Temperatures like the triple point of water and the quadruple point of water and ether are referred to generally as the *multiple points* of chemical systems. The above examples, involving physical transformations alone (melting, freezing, evaporation, solution), have been considered here for simplicity's sake. But the phase rule is equally applicable to systems in which very complex chemical phenomena may be taking place, and its value lies largely in the fact that it likens very complex phenomena of chemical equilibrium to the simple phenomenon of the physical equilibrium between water and ice. It further, evidently, permits of classifying the phenomena of chemical equilibrium with reference to the number of substances taking part in them, and thus possesses considerable didactic importance. Finally, it can serve as a guide to the discovery of new substances (for instance, new hydrates of inorganic salts) that may appear as phases in chemical systems in equilibrium and thus render service to certain branches of purely experimental research.

One more important application of thermodynamics to chemical phenomena has been made and requires mention in the present sketch. Thermodynamics, in studying a transformation of some material system, endeavors to ascertain the maximum mechanical work that might be produced by the transformation, the 'maximum work' meaning the work that might be obtained by the use of some ideal mechanical device, frictionless and permitting, so to speak, of *no leakage* of energy. The importance of knowing this maximum of work is very great. Any natural change taking place of itself—whether it be the falling of a stone, the expansion of a compressed gas, the combustion of coal, or any other change, mechanical or chemical—may be used to produce mechanical work; and no material system is capable of changing unless it possesses *the capacity for producing work*—or, as Helmholtz terms it, 'free energy.' In other words, it may be said that it is *because* a system can produce mechanical work that it is capable of changing spontaneously. The burning of coal (i.e. the chemical transformation of the system, carbon and oxygen), once started, can go on of itself *because* it can be used to produce mechanical work, or, what is the same, because the system carbon and oxygen possesses a certain amount of free energy. When, therefore, the free energy of a system has been used, without loss, to produce mechanical work, and that work has been measured, we have a measure of the cause of the given transformation. The cause of chemical transformations is generally termed 'chemical affinity.' Obviously, then, the maximum work that can be produced by a chemical transformation is a measure of the chemical affinities involved in it, and this is why the determination of maximum work has great importance for chemical theory. But it may also be valuable for purely practical purposes. Take, for instance, again the combustion of coal. It is well known that steam engines are very wasteful of energy. In connection with the problem of a more economic use of coal the question must naturally arise, How much mechanical work could possibly be obtained altogether by burning a certain amount of coal, supposing that an ideally perfect device were employed for the purpose? The direct measurement of the maximum work, although theoretically possible, could not be actually carried out. But the maximum work of a reaction can be readily calculated, with the aid of thermodynamics, if the concentrations of the reacting substances and their products, when in the state of chemical equilibrium, are known. In the case of the combustion of coal the equilibrium-concentrations have been determined by indirect measurement, and on the basis of this Nernst has calculated approximately the maximum work of the combustion for three different temperatures: If 12 grams of carbon were burned at the absolute zero (—273° C.), the equivalent of 97,650 calories might be obtained; at 18° C. the maximum work would be equivalent to 91,470 calories; at 1000° C. the equivalent of only 70,625 calories can be obtained; this in spite of the fact that the heat given off by the combustion is practically the same at all temperatures, viz. 97,650 calories. Only at the absolute zero of temperature could the heat produced by the combustion of coal be entirely transformed into mechanical work.

In conclusion, a few words must be said with reference to an erroneous principle that has gained somewhat wide acceptance among chemists—viz. Berthelot's principle, according to which it is the heat produced by a reaction, and not the maximum possible mechanical work, that measures the cause of the reaction; and of two reactions that might take place in a given system, the one accompanied by the greatest evolution of heat must necessarily take place. This principle holds good often, but not always, and so cannot be looked upon as a law of nature. The most important argument against it is that, were it unlimited in its application, as Berthelot claims it to be, reversible reactions would be impossible; for one of a pair of reversible reactions not only does not *develop* heat, but necessarily *absorbs* heat; and hence, if Berthelot's principle were correct, that reaction could not take place at all, and its opposite reaction would be complete. See REACTION, CHEMICAL.

The principal names connected with experimental thermo-chemistry are those of Hess, Julius Thomsen, Berthelot, and Stohmann. The first to apply the principles of thermodynamics to chemical phenomena was Horstmann. The problem was next taken up by Dr. Gibbs, of Yale University, whose thorough and original treatment of the subject remained unknown for a number of years. The importance of Van 't Hoff's thermo-chemical work may be readily seen from the present sketch. Finally, Le Chatelier, Planck, Riecke, and Duhem have made noteworthy contributions to the mathematical treatment of the subject.

BIBLIOGRAPHY. Thomson, *Thermochemische Untersuchungen* (Leipzig, 1882-86); Berthelot, *Thermochimie* (Paris, 1897); id., *Traité pratique de calorimétrie chimique* (ib., 1893); Muir and Wilson, *The Elements of Thermal Chemistry* (London, 1885); Jahn, *Die Grundsätze der Thermochemie* (Vienna, 1892); Planck, *Grundriss der allgemeinen Thermochemie* (Breslau, 1893); Naumann, *Thermochemie* (Brunswick, 1892). Consult also the literature of theoretical and physical chemistry recommended in the article CHEMISTRY.

THERMO-COUPLE, THERMOPILE. See THERMO-ELECTRICITY.

THERMODYNAMICS (from Gk. *θέρμη*, *thermē*, heat + *δύναμις*, *dynamis*, power). The application of the principles of mechanics to heat-phenomena. It is shown in the article HEAT that all heat-effects can be traced for their cause to work having been done against the molecular forces of the body—e.g. friction, compression, etc.—or to the reception of energy by the minute portions of the body—e.g. radiation, conduction, etc. In short, it may be regarded as proved experimentally that heat-effects always accompany changes in the intrinsic energy of a body; and the idea that the numerical value of the heat-effects depends on the *energy* added to the minute portions of the body and on that alone is now accepted by every one. If a small amount of energy ΔQ is added to a body, its intrinsic energy is changed (dU) and as a rule a certain amount of external work is done by the expansion of the body (pdv, where p is the external pressure on the body and dv is the change in volume). By the conservation of energy, then, if no other work is done,

$$\Delta Q = dU + pdv.$$

This is sometimes called the 'first principle of thermodynamics.'

In any form of heat engine—e.g. a steam engine—the 'working substance,' water, starts at ordinary temperature; heat-energy is added to it by the boiler; it reaches a high temperature, that of the boiler, and a high pressure; it expands, doing work in pushing out the piston; its temperature and its pressure therefore fall; the 'cylinder' is now joined to the 'condenser,' and the steam passes out and is condensed to water, giving up heat-energy; the piston is drawn back and the process is repeated. So far as the heat-energy and work are concerned, heat-energy (Q_1) at a high temperature has been given to the working substance, heat-energy (Q_2) at a low temperature is taken away from it, external work (W) is done. By the first principle of thermodynamics $W = Q_1 - Q_2$, if we assume that the water at the end of its cycle of changes has the same energy that it had at the beginning. The 'efficiency' of the process is defined as the ratio $\frac{W}{Q_1}$ or $\frac{Q_1 - Q_2}{Q_1}$. In considering the efficiencies of various processes Carnot in 1824 was led to imagine one which bears his name and which can be discussed theoretically. This process is one which consists of a working substance inclosed in a cylinder with a movable piston passing around a cycle so as to return to its initial condition. There are supposed to be two large reservoirs of a liquid, at different temperatures. The cylinder containing the working substance at a high pressure and small volume is imagined placed in the high-temperature tank; the substance is allowed to expand, so slowly that its temperature remains practically unchanged at that of the surrounding liquid in the tank; in doing this, heat-energy must flow into the working substance, otherwise its temperature would fall; after the volume has increased sufficiently, the cylinder is removed from the tank, and the inclosed substance is allowed to expand under such conditions that no heat-energy can enter, and its temperature falls; when it reaches that of the second tank the cylinder is placed in it, the piston is forced in by external force, thus reducing the volume; if this process is done slowly the temperature will not rise, but heat-energy will flow out into the liquid of the tank; when the volume is sufficiently reduced, the cylinder is removed and the piston is pushed in under such conditions that no heat-energy can leave or enter; if the volume at the beginning of this last step is chosen correctly the working substance will after a sufficient compression be restored to its original condition. There have been four steps, two 'isothermal' and two 'adiabatic.' The net result is: No change in the working substance; external work (W) done by the substance; heat-energy Q_1 withdrawn from the high-temperature tank; heat-energy Q_2 given out to the low-temperature tank. Therefore, by the first principle of thermodynamics,

$$W = Q_1 - Q_2.$$

This process of Carnot's is perfectly 'reversible;' by doing an amount of work W on the working substance it may be made to pass around the cycle in the reverse way; the low-temperature bath losing an amount of heat-energy Q_2 and the high-temperature bath gaining an amount Q_1. The conditions for reversibility are that each 'point' of the whole cycle should be one of equilibrium; and it is apparent that for this to be satisfied the changes must all be made slowly and that when the substance receives or gives out heat-energy it must be in contact with a large tank of liquid at the same temperature, within an infinitesimal amount, as it itself is at that instant. (If a gas expands out of a high-pressure reservoir into the open air—e.g. illuminating gas rushing out of a burner—the process is irreversible; if in an engine the flame is at a higher temperature than the steam in the boiler—as it always is—the process is irreversible.) It was stated by Carnot that the efficiency of his process, $\frac{W}{Q_1}$, was the same for all working substances and depended alone on the temperatures of the two baths. His proof was, however, erroneous, and was corrected by Clausius in 1850, who showed that the statement was correct if one assumed that heat-energy of itself always passes from high to low temperature. The statement that heat-energy of itself does always pass from high to low temperature is called the 'second principle of thermodynamics.' Lord Kelvin has shown that this principle is identical in its conclusions with the assumption that it is impossible by any material agency to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects.

Since $\frac{W}{Q_1}$ is a function of the temperatures of the two tanks alone, it is possible to give such numbers to the temperatures of these tanks as will be independent of the working substance (i.e. thermometric substance). Kelvin—then William Thomson—suggested that the numbers T_1 and T_2 be so chosen for the temperatures of the tanks that $\frac{T_1}{T_2} = \frac{Q_1}{Q_2}$. In this case $\frac{T_1 - T_2}{T_1} = \frac{Q_1 - Q_2}{Q_1} = \frac{W}{Q_1}$ and is therefore independent of everything except the temperatures; $T_1 - T_2$ may be chosen to have any arbitrary value; $\frac{T_1}{T_2}$ is fixed by the above definition as depending upon making the thermometric substance pass around a Carnot's cycle; and then T_1 and T_2 are obtained. It is found by direct experiment that if $T_1 - T_2$ is chosen as 100 for two tanks of melting ice and boiling water, the numbers on 'Thomson's absolute scale' are almost exactly the same as obtained in a gas thermometer using the 'absolute centigrade scale.' See THERMOMETRY.

Since the efficiency increases as T_2 becomes smaller, and since the efficiency cannot be greater than unity, there must be a minimum temperature in the universe. This is known as the 'absolute zero;' its value is about 273° C., as shown by the agreement between the two 'absolute scales' just described.

Carnot stated further that the efficiency of an irreversible process could not be greater than that of a reversible one with the two limiting temperatures of the tanks; and Clausius proved that this is true if the second principle of thermodynamics is true.

It is generally accepted that the efficiency of an irreversible process is less than that of a reversible one between the same two temperatures, but it cannot be regarded as a deduction from the two principles of thermodynamics. All processes in nature—chemical, electrical, etc.—are irreversible; and a natural system will therefore be in equilibrium if all imaginable processes compatible with the existing conditions necessarily involve an efficiency equal to or greater than that which corresponds to a reversible process. This general idea forms the basis of the modern development of thermodynamics by Gibbs, Planck, and others.

BIBLIOGRAPHY. Buckingham, *Theory of Thermodynamics* (New York, 1900); Gibbs, "Equilibrium of Heterogeneous Substances," in *Transactions of the Connecticut Academy of Sciences*, vols. ii. and iii.; Mach, *Die Principien der Wärmelehre* (Leipzig, 1896); Planck, *Thermodynamik* (ib., 1897); Magie, *The Second Principle of Thermodynamics*, Scientific Memoir Series, vol. vi. (New York, 1899); Ames, *The Free Expansion of Gases*, Scientific Memoir Series, vol. i. (ib., 1898).

THERMO-ELECTRICITY. It was observed by Seebeck in 1822 that, if the two junctions of a closed metallic circuit made up of two different wires in series were at different temperatures, there was produced an electric current. As the difference of temperature at the junctions is increased, the current increases. It was shown, however, by Cumming in 1823, that for any temperature of one junction there is one for the other junction such that there is no current: this is known as the temperature of 'inversion.' If in general, then, the temperatures of the junctions are made more and more different, the current increases, then decreases, becomes zero, and is finally reversed. The average of the temperatures of the junctions when the current is zero is called the 'neutral' temperature, and is a constant for any two bodies.

These thermo-electric currents are due to molecular actions at the junctions and also throughout the conducting wires, owing to their nonuniformity of temperature. Where the two different metals join there are electric forces called the 'Peltier electro-motive forces;' while the electric forces through the conductors themselves are called 'Thomson electro-motive forces.' The existence of these electro-motive forces is proved by forcing a current around a circuit by means of a battery or cell; at the junctions there is rise or fall of temperature, depending upon the direction of the current, showing a force opposing or helping on the current; similarly the conductor itself has its temperature raised or lowered, depending upon the direction of the current—quite apart from the usual heating effect of a current.

The properties of thermo-electric currents are best studied by diagrams. Some one metal is chosen as a standard; lead is generally selected because it has no 'Thomson effect.' A circuit is made part of lead and part of another metal; one junction is kept at 0° C., and while the temperature of the other is varied continuously, both above and below zero the total electromotive force around the circuit is measured. These values of the E.M.F. for different values of the temperature of the variable junction are plotted in a curve, having E.M.F. for ordinates and temperatures for abscissæ. These curves when drawn for different bodies—all with reference to lead—are found to be approximately parabolas. Another form of diagram is made as follows: The junctions of the two metals, one of which is lead, are kept at temperatures T and $T + \Delta T$, where ΔT is a small quantity; the resulting E.M.F. around the circuit is measured, call it ΔE. The ratio $\frac{\Delta E}{\Delta T}$ is called the 'thermo-electric power;' it is evidently a function of the temperature T, and when plotted on a diagram having temperatures as abscissæ, the curves are practically straight lines.

A thermo-couple is one of the most sensitive instruments known for detecting differences in temperature. It can be improved by joining in a zigzag series several couples: first, a piece of bismuth, then one of antimony, then one of bismuth, etc., the first end of the first piece of bismuth and the last end of the last piece of antimony being joined by a wire passing around a galvanometer. Thus every other junction of bismuth and antimony is turned to form one face of the zigzag; and, if one face is at a higher temperature than the other, each couple helps the others, and thus a considerable current may be produced through the galvanometer. Such a combination of couples forms a 'thermopile.' It was invented by Nobili in 1834.

THERMOMETER (from Gk. *θέρμη*, *thermē*, heat + *μέτρον*, *metron*, measure). An instrument for measuring temperature, but in early times erroneously supposed to measure heat. A brief account of the underlying theory and the history of thermometry are given under the title THERMOMETRY. This article will deal only with those forms of thermometers that are at present in ordinary use.

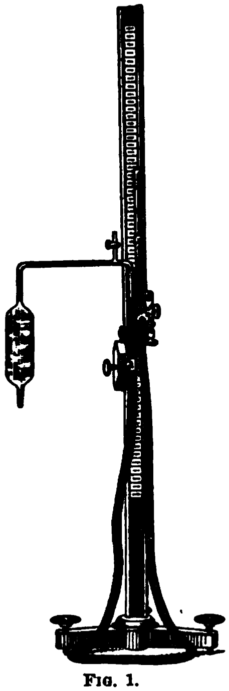


FIG. 1.
JOLY AIR THERMOMETER.

THE AIR OR GAS THERMOMETER. This form of the instrument is accepted as the standard and the indications of mercurial, alcohol, or other thermometers are all supposed to be corrected so as to agree with the standard adopted by the International Bureau of Weights and Measures at Paris. This standard consists of a hollow bulb of platinum filled with pure, dry nitrogen. When kept at a uniform pressure the volume of the gas expands in direct proportion to its temperature. By calling the volume at the melting point of ice V, and the volume at the boiling point of water V + 100°, we establish a scale of centigrade degrees, which may be extended above or below these limits, so that, for instance, the temperature of the absolute cold or entire absence of heat would be —273° C. and the temperature of the boiling point of mercury would be about +357° C. Numerous precautions are needed in the use of the air thermometer, all of which are explained in the *Travaux et mémoires* of the International Bureau of Weights and Measures, and in Guillaume, *Thermométrie* (Paris, 1890). According to the theories of thermodynamics the peculiarities of platinum, nitrogen, or of any other materials that may be used, introduce small irregularities, so that the scale of equal changes of volume is not exactly proportional to the quantity of heat or the change in temperature. Therefore some recommend that a slight correction be applied to the nitrogen gas thermometer in order to obtain the ideal thermodynamic equivalent. In Fig. 1 we see the simplest or portable form of air thermometer, as arranged by Joly, for measuring temperatures below the boiling point of water. The large glass bulb on the left is filled with dry air, or dry nitrogen, and ends in a short vertical glass tube attached to the flexible rubber tube whose other end opens into another short glass tube, shown on the right-hand side, whose upper end is hermetically closed and constitutes the vacuum chamber of a barometric column of mercury. The glass bulb is immersed in a liquid or gas whose temperature is to be measured. If the volume of the inclosed gas expands with the higher temperature that is to be measured, then this expansion is counterbalanced by raising the vacuum chamber and the flexible tube on the right until the increased pressure of the mercury column compresses the expanding gas in the large bulb so as to keep it at a constant volume, which is indicated by the fact that the mercury in the left-hand tube just touches the tip of a fine glass point that is permanently fastened inside the tube. The pressure exerted by the mercurial column is measured by the difference in the level of the mercury in the right-hand and left-hand tubes. The scale for this measurement is graduated on a strip of mirror set into the vertical framework that supports the bulb and the tubes.

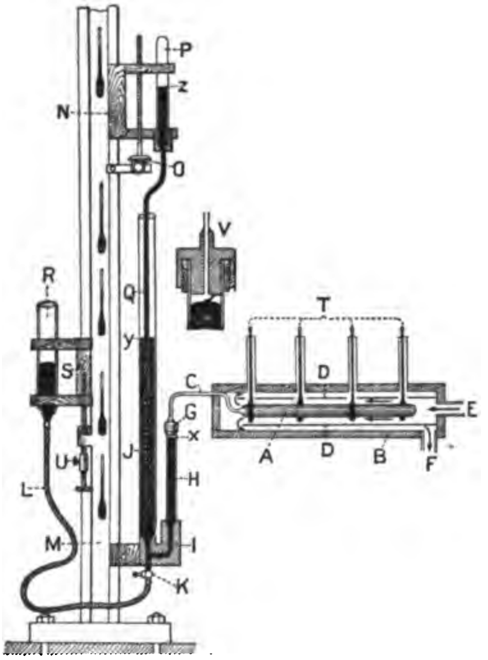


FIG. 2. CHAPPUIS AIR THERMOMETER.

In Fig. 2 we see an arrangement of the air thermometer for more exact measurements, etc. The thermometric substance (nitrogen) is inclosed in the platinum bulb A, which is supported inside of a bath, B, which is so arranged that the hot gas or liquid whose temperature is to be measured may completely surround the bulb by flowing in at E and out at F. D D are metal screens. There are a number of mercurial thermometers, T, which are at the same temperature as the bulb. The bulb communicates with the barometer at G by the tube C, the connection being shown enlarged at V. The pressure of the mercurial column needed to keep the gas in the bulb at a constant volume is that due to the height of the column from X to Y, and may amount to several atmospheres, or to a height of many feet. The lower end of the mercurial column, or the tube H, I, J, K, is fixed, but the upper tube, P Q, can be raised indefinitely. As Q rises inside of the large tube, J, more mercury may be needed, and this is supplied from the reservoir, R, through the flexible tube, L. The difference in height between the mercurial surfaces at X and Z is measured by a reading telescope or cathetometer. M is the upright standard carrying the apparatus, N a movable cradle for the barometer tube worked by the adjusting screw O. S is a similar arrangement for the reservoir, R, with its adjusting screw, U.

THE MERCURIAL THERMOMETER. This consists of a glass bulb terminating in a long capillary tube. The bulb and lower portion of the tube are filled with clean mercury, while the upper portion is supposed to be quite empty and to be hermetically sealed. When the bulb is warmed the mercury is seen to rise in the tube, because it expands more than the glass of the bulb. This difference of expansion is not regular, nor is it the same for all kinds of glass or for impure mercury. If we wish to construct an independent standard mercurial thermometer, we immerse the bulb in melting ice and make a slight scratch on the glass tube to mark the height of the mercurial column. A similar mark is made for boiling water and the space between the two is divided into a hundred equal parts for centigrade degrees, or a hundred and eighty equal parts for Fahrenheit degrees. This intermediate space is called the fundamental distance. Owing to the irregular expansion of mercury in glass, the so-called standard mercurial thermometer will differ from the standard air thermometer by as much as half a degree about midway between freezing and boiling water. Therefore for accurate work the mercurial should be carefully compared with the air thermometer and the resulting system of corrections throughout the entire length of the scale should be well determined and carefully applied. Owing to the gradual contraction of the glass bulbs, which goes on for several years after they are freshly made, the mercurial thermometer usually has an error that increases with the lapse of time. This error is due to the change in the volume of the bulb, and should be determined after any important work has been done by immediately making a new determination of the freezing point. Instead of this procedure the error can be calculated theoretically, but the actual new determination is far preferable.

A thermometer is not considered first class whose errors of division exceed one or two tenths of a degree centigrade, or two or three tenths Fahrenheit. In determining the temperature of a liquid by the use of the mercurial thermometer one must be very careful to keep the liquid thoroughly stirred, because when permitted to rest the colder portions of the liquid settle. In meteorological work all thermometers are exposed in some sort of protecting cage through which the wind may blow freely, but into which the sun's rays, or any obnoxious radiation, cannot penetrate. It is believed that after making due allowance for the sluggishness of the thermometers and the inefficiency of the screens and the ventilating apparatus, it is still true that the various meteorological services of the world obtain the temperature of the air within a half degree Fahrenheit or two-tenths Centigrade. A general comparison between the Centigrade and Fahrenheit scales is given in the accompanying table:

CENT.	FAHR.
+125°	+257°
100	212
75	167
50	122
+ 25	+ 77
0	+ 32
— 17.8	0
— 25	— 13
— 40	— 40
—273	—491

THE DEW POINT THERMOMETER. This is an ordinary thermometer specially arranged for the determination of the temperature at which dew is formed in the atmosphere when the air is cooled. To this end the bulb and larger part of the stem of the thermometer are immersed in a thin glass cup nearly full of sulphuric ether. A current of air is driven rapidly through the ether, causing it to evaporate and therefore to cool. The thermometer follows the falling temperature of the ether until the observer perceives the deposition of dew on the outside of the glass cup. The current of air is then cut off. The ether and glass cup begin to warm; the dew evaporates from the surface, and as it disappears the temperature is again read off. The mean of the two readings of the thermometer corresponds closely to the dew point. See HYDROMETER.

THE WET BULB THERMOMETER. This is an ordinary thermometer whose bulb is covered very neatly with the thinnest muslin which is kept wet. The wet bulb thermometer should either be rapidly whirled in the air or else exposed to a current of air at the rate of five or ten feet a second. The evaporation of the water cools the thermometer to the temperature of evaporation, which is about half way between the temperature of the air and the temperature of the dew point. The combination of a dry bulb and a wet bulb thermometer constitutes a psychrometer, and the whirled or ventilated psychrometer is the ordinary apparatus used by meteorologists for determining the humidity of the atmosphere. The formulæ and tables used by the Weather Bureau in this work are those prepared by Professor C. F. Marvin and published as Weather Bureau Document No. 235 (Washington, 1900). See HYGROMETER for illustration and further description.

THE ALCOHOL THERMOMETER. This differs from the mercurial thermometer only in that the interior liquid is alcohol. But this difference is important from many points of view, since one class of errors disappears and another is introduced. Alcohol or ether must be used for the measurement of very low temperatures, since mercury freezes at about —40° Fahrenheit. The principal error in using the alcohol thermometer for low temperatures arises from the fact that the liquid becomes viscid, adheres to the sides of the glass tube, and requires a long time to drain down, which indeed it never does perfectly. The alcohol thermometer cannot be used for temperatures above its boiling point or 80° Centigrade, whereas the mercurial can be used up to a temperature of about 350° Centigrade.

SOLAR RADIATION THERMOMETER, OR BLACK BULB THERMOMETER. This is essentially an ordinary mercurial thermometer, whose bulb is covered with a thin layer of non-reflecting and almost perfectly absorbing lampblack. Under the assumption that the black bulb thermometer absorbs and radiates more easily than the plain glass bulb, and especially more so than a polished silver bulb, the difference between the readings of two such thermometers exposed to the sunshine will depend primarily upon the intensity of the radiation received by them. In order to measure the solar radiation, it is necessary, first, to diminish as much as possible the conduction and convection of heat to or from thermometer bulbs. They are, therefore, inclosed in large thin glass bulbs within which there is as perfect a vacuum as it is possible to make. It is also necessary to cut off as much as possible of radiation from the surrounding objects, and especially reflected sunshine by means of screens. Under these conditions the solar radiation thermometer, or the so-called Arago-Davy actinometer may be used in two ways: (1) The static method. The thermometers are allowed to attain the highest temperatures they can in the full sunshine; the difference between their readings expresses approximately the intensity of the solar radiation, the exact value of which may be more exactly computed by the method and formulæ given by Professor William Ferrel in his memoir "Temperature of the Atmosphere and Earth's Surface," pages 34-50, *Professional Papers of the Signal Service No. 13* (Washington, 1884). (2) The dynamic method. The bright and black bulb thermometers are successively exposed to the full sunshine and shaded from it a minute at a time, so that one may determine the initial rate of increase of temperature in the sunshine and the rate of cooling in the shade. From these rates the solar radiation is calculated by the formulæ first applied by Pouillet to his actinometer.

U. S. WEATHER BUREAU MAXIMUM AND MINIMUM THERMOMETER.

THE MAXIMUM THERMOMETER. This is usually a mercurial thermometer having a device by which the top of the column of mercury remains at the highest point that it attains during any given interval of time until the observer has recorded the reading and adjusts the instrument for another observation. In the Rutherford maximum the stem of the thermometer lies nearly horizontal. The rising mercury pushes a little steel index upward within the bore of the tube. When the temperature falls the index is left in place until the observer draws it back to the top of the mercurial column by means of a magnet. In the Phillips or Walferdin thermometer the thermometer stem is horizontal. A small bubble of air makes a permanent break in the upper part of the mercurial column. When the temperature begins to fall the lower column contracts into the bulb, but the upper portion remains and registers the maximum temperature. The Negretti and Zambra maximum thermometer has the bore of the tube constricted below the bottom of the scale so that the mercury that has pushed up past this point cannot easily slide back. After the maximum temperature has been recorded the observer forces the column of mercury back by whirling the thermometer in a circle. The clinical thermometers of physicians are made after this pattern.

THE MINIMUM THERMOMETER. The best form of this is the Rutherford alcohol minimum, in which the stem is kept nearly horizontal, and the contracting column of alcohol draws downward a light steel or glass index, which remains in place when the temperature rises. The observer sets the index anew by drawing it back by means of a magnet.

COMBINED MAXIMUM AND MINIMUM OR SIX'S THERMOMETER. This consists of a U-shaped tube whose upper ends have respectively a large bulb full of alcohol and a small bulb containing air and vapor of alcohol. The lower portion of the legs of the U is filled with mercury and in each leg there floats an index. One of these indices is forced up by the expansion of the alcohol in the bulb and the index is left at the maximum temperature. The other index is raised by the contraction of the alcohol and the consequent rising of the mercury which is pushed up by the expansive force of the air pressure in the small bulb. Modifications of this thermometer are used in Austria, England, and America, but none of its forms is considered to be so reliable as the separate maximum and minimum thermometers previously described.

The Upsetting Thermometers. These were invented by Negretti and Zambra and have been modified and improved from time to time. An ordinary thermometer has its tube so bent that when the thermometer is turned upside down the column of mercury above the constriction will run off into a separate portion of the tube, where it remains until the observer can make the necessary reading. The thermometer is especially adapted for recording deep ocean temperatures or temperatures at any hour of the night.

Metallic Thermometers. These depend for their action upon the differential expansion of metals. As made by Breguet, 1817, or Herrman and Pfister, 1865, they consist essentially of two thin spiral bands of different metals soldered together. Differences of temperature cause the spiral to coil or uncoil and the apparatus can easily be adapted for self-registration.

Optical Thermometers. The plane of polarization of a quartz crystal is rotated about the axis of a beam of light by the varying temperature of the quartz, increasing with great regularity with the increase of temperature. This apparatus is recommended by Cornu for the study of high temperatures when the gas thermometer fails because of the softening of the bulbs containing the gas or air.

Electric Thermometers. Melloni's thermo-electric pile. Pairs of pieces of different metals are soldered together and the extremities communicate by a wire with a needle galvanometer. Any difference of temperature between two consecutive junctions causes the electric current to traverse the wire; its strength is measured by the galvanometer. The absolute value of the galvanometer scale can be expressed in thermometric degrees by means of careful comparisons. The thermo-electric thermometer can be made to give extremely reliable results.

Resistance-Coil Thermometer. (1) Absolute resistance—the resistance experienced by an electric current flowing through an insulated wire—ordinarily increases with the temperature of the wire, and is shown by the deflection of a galvanometer needle. The resistance is not precisely proportional to the temperature, but if it has been determined at several temperatures the wire or coil can be used for all other temperatures. By using a coil of platinum wire, a wide range of temperatures may be measured with great accuracy. See Marvin, "Recent Progress in Physical Science," *Bulletin of Philosophical Society* of Washington, vol. xiv., p. 110. (2) Differential resistance. Two similar resistance coils are balanced against each other, one of them being in the region whose temperature is to be measured, the other in a bath of liquid whose temperature can be varied and can be observed at any time by means of a thermometer. If the galvanometer needle shows that the resistance of the two coils is the same, then it is understood that the temperatures must be the same. If the resistances differ, then the liquid surrounding the accessible coil is warmed or cooled until equality is attained.

The Thermophone. This is a differential resistance thermometer, as just described, but combined with a telephone instead of a galvanometric needle. The equality of temperature due to the absence of an electric current is indicated by the absence of all sound when one listens at the telephone. This instrument, the invention of G. C. Whipple, is both accurate and portable and very convenient for use in boats on lakes or at sea. Consult "The Thermophone," *Technology Quarterly*, vol. viii., p. 25 (Boston, 1895).

Langley's Bolometer. This is a differential thermometer in which the difference of temperature of two delicate wires is shown by the deflections of a galvanometric needle. See Bolometer.

Deep Sea Thermometer. This is an ordinary or self-registering mercurial thermometer wholly inclosed within a very strong protecting case of glass. The space between the thermometer and its inclosure is partly filled with water or mercury above which some air remains. When this arrangement is lowered to the bottom of the ocean the great external pressure compresses the inclosure, but does not seriously affect the bulb of the thermometer within.

Soil Thermometer. This was formerly made with a large bulb and wide tube many feet in length so that a bulb buried at a depth of even twenty feet would show the top of the liquid column above the surface of the earth. As these were expensive, sluggish, and liable to accident, the modern practice is to use an ordinary thermometer inclosed in a wooden tube and pushed down to the proper depth in a hole in the ground. Modern electric thermometers, especially the thermophone, are to be recommended.

Nocturnal Radiation Thermometer. This is supposed to give the approximate temperature of a surface exposed to radiation during the night time. The bulb is of glass, sometimes, but not necessarily, blackened; it is fully exposed to the open sky. If all terrestrial heat is cut off by screens the thermometer may be made to give an indication of the clearness of the sky or the temperature of the air that occupies the dome of the sky. If, however, no attempt is made to cut off the radiation and conduction of heat, the thermometers give the temperature of the leaves on the trees. If the thermometer lies upon the upper surface of a metal or wooden or stone object it gives approximately the temperature of the upper surface layer of that object.

Integrating Thermometer. This is intended to sum up the temperature, or it may be the temperature changes during any given interval of time. A clock or chronometer whose pendulum or balance wheel is uncompensated or even intentionally over-compensated has a rate that varies with the temperature and becomes an admirable integrator. A metal bar supported on an inclined surface by means of sharp-pointed feet at either end, creeps upward with alternating rising and falling temperatures. Each step of its progress is proportional to the difference between the successive maxima and minima. Thus such an arrangement will, in the course of a month, sum up the daily ranges of temperature.

THE EVAPORATION THERMOMETER. In 1888 Dr. Müller-Erzbach brought out a thermometer in which a vessel full of water in the sunshine communicates with an empty vessel in the shade. The water evaporated in the former condenses over into the latter vessel where it is absorbed by concentrated sulphuric acid. The weight lost in one vessel or gained in the other is an index to the average temperature that has prevailed in the water flask. Comparative observations give the means of converting these weights into temperatures. Experimental tests of this form of integrating thermometer made at the Seewarte in Hamburg show that this apparatus gives excellent results when the daily temperature variations are not too great.

THERMOGRAPHS. This term may include all forms of apparatus in which continuous registration is introduced. To this end the English Meteorological Office employs photography, maintaining, as it were, a continuous photographic register of the variations of the top of the mercurial column. The French and the United States Weather Bureaus use the thermographs made by Richard at Paris, in which some form of metallic thermometer is attached to a pen which moves vertically over a sheet of paper that is drawn horizontally by clockwork so that the temperature may be subsequently read off at any given moment.

Owing to the great importance of the thermometer in every branch of science and the arts, the principal governments of the world have established bureaus of standards for the comparison and calibration of this and other forms of measuring apparatus. In all cases private individuals may send their thermometers to these institutions for examination and may receive certificates stating the exact value of the corrections for their errors if any exist. Such institutions are the following: the Kew Observatory at London, now a branch of the Bureau of Standards; the Imperial Physical and Technical Institute at Charlottenburg, near Berlin; the International Bureau of Weights and Measures, Paris; and the Bureau of Standards established by the United States Government at Washington, under the Treasury Department in 1900, and transferred to the Department of Commerce and Labor in 1903. See THERMOMETRY and the works of reference there mentioned.

THERMOMETRY (from Gk. *θέρμη*, *thermē*, heat + *-μετρία*, *-metria*, measurement, from *μέτρον*, *metron*, measure). The science of assigning proper numerical values to the temperature of bodies. As explained in HEAT, this involves several steps, the arbitrary selection of: (1) some substance as the thermometric body, (2) some property of it which changes with the temperature, (3) two standard thermal states, e.g. melting ice and boiling water at standard pressures, (4) the scale or the number of degrees between these standard temperatures, and (5) a number to give one of these standard temperatures.

By definition the 'temperature on the standard hydrogen thermometer,' Centigrade scale, is as follows:

Hydrogen is the gas used, the initial pressure being 100 cm. of mercury. Change in pressure at constant volume is the effect measured.

The two standard thermal states are (1) melting ice and (2) vapor rising from boiling water at normal atmospheric pressure.

One hundred degrees are chosen between these two temperatures. The temperature of melting ice is called 0°. Then, if p_0 is the pressure of the gas at 0°, p_{100} that at 100°, and p that at the temperature (t) to which a number is to be given,

$$t = 100\frac{p - p_0}{p_{100} - p_0}.$$

Other gases than hydrogen might be used; and the same definition would apply to temperature on the new scale as on the hydrogen scale. Slight differences, however, would always be observed between the numerical values for the same temperatures.

If the change in volume is the heat-effect observed as the temperature is changed, the obvious definition of the numerical value of the temperature is

$$t = 100\frac{v - v_0}{v_{100} - v_0}$$

where v_0, v_{100}, v are the measured values of the volume of the gas or liquid at 0°, 100°, t°.

If the change in the electrical resistance of a given conductor is the heat-effect measured as the temperature is changed, the definition of t is

$$= 100\frac{R - R_0}{R_{100} - R_0}$$

where R_0, R_{100}, R are the electrical resistances at 0°, 100°, t°.

Similarly almost any heat-effect of any body may be taken as the one to measure in order to secure a number for temperature; but the numbers so found all differ in general; and if any thermometer other than the hydrogen one is actually used, the observed numbers must all be corrected by a calibration table connecting the scale of the thermometer used with the hydrogen one.

For measuring ordinary laboratory temperatures either mercury-in-glass or air-thermometers are used; for measuring extremely low temperatures, e.g. —200° C., a hydrogen thermometer or a platinum-resistance thermometer is generally used; for high temperatures, e.g. 300° C., a platinum-resistance thermometer or a thermocouple is used. (See THERMOMETER and THERMO-ELECTRICITY.) For a full discussion of these and other methods reference should be made to the Reports of the International Congress of Physics, Paris, 1900, vol. i., articles by Chappuis and Barus.

The scale of temperature as defined above is known as the 'Centigrade' or 'Celsius' (q.v.) scale. There are several other scales in use. The 'Fahrenheit' scale has 32° for the melting point of ice and 212° for the boiling point of water; the 'Réaumur' (q.v.) scale has 0° for the former temperature and 80° for the latter; the 'absolute gas scale' adds to the temperature on any scale the reciprocal of the coefficient of cubical expansion of hydrogen as determined on that scale—on the Centigrade scale this reciprocal is 273.04, and so t° C. is $(t \times 273.04)^\circ$ absolute. It is shown in THERMODYNAMICS (q.v.) that there is a method of defining temperature which is quite independent of the thermometric substance, and in which the only arbitrary things are the choice of a number for the difference between the temperatures of any two thermal states. This scale is called 'Thomson's absolute scale,' because it was proposed by William Thomson (now Lord Kelvin). If it is agreed to have the temperature of freezing and boiling water 100° apart, it is found that the numbers on the Thomson absolute scale agree most remarkably with those given on the absolute gas scale as defined above.

HISTORY. The invention of the thermometer must be attributed to Galileo, who in about the year 1593 made an open-air thermoscope, consisting of a bulb with a long tube attached, which was provided with a scale and dipped below the surface of a liquid—water or wine; some of the air was expelled from the bulb, and so the liquid rose in the tube. This thermometer was used by Galileo for various purposes, such as studying freezing mixtures and recording atmospheric temperatures. It was later used (1611) by Sanctorius in the diagnosis of fevers. The word 'thermoscope' was used by Bianconi in 1617, and 'thermometer' in 1624 by Leurechon. The first scaled thermometers were those of Ferdinand II., Grand Duke of Tuscany (1641); these contained alcohol. In 1661 Fabri made a scale, using as the 'fixed' temperatures those of snow and of midsummer heat. Robert Hooke in 1664 proposed the freezing point of water as one of the fixed temperatures; and in 1694 Renaldini proposed this as one, and the boiling point of water as the other. In 1709 Fahrenheit introduced his alcohol thermometers, and 1714 his mercury ones. About 1731 Réaumur devised his scale, which until recently was in extensive use on the Continent of Europe. In 1742 Celsius proposed a Centigrade scale, with the temperatures of melting ice 100° and boiling water 0°. Christin, working independently of Celsius, proposed a Centigrade scale in 1743 which is the Celsius scale inverted, and is the one used now. A complete history of the ordinary thermometer is given in Bolton, *Evolution of the Thermometer* (Easton, Pa., 1900); in Abbe, *Meteorological Apparatus and Methods* (Washington, 1887); and Gerland and Traumüller, *Geschichte der physikalischen Experimentierkunst* (Leipzig, 1899). See THERMOMETER.

THERMOPHONE. See THERMOMETER.

THERMOPILE. See THERMO-ELECTRICITY.

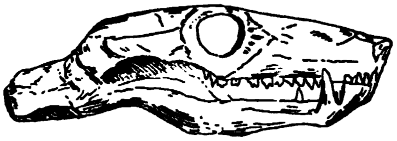
THERMOP'YLÆ (Lat., from Gk. *Θερμοπύλαι*, from *θερμός*, *thermos*, hot + *πύλα*, *pyla*, gate). A pass famous in ancient Greek history, leading from Thessaly into Locris, named from the presence of several hot springs. It is situated south of the present course of the river Sperchius, between Mount Œta and the Maliac Gulf. In ancient times it was only a narrow track, perhaps fifty feet wide, but the alluvial deposits have altered the coast line so that there is now a broad swampy plain from a mile and a half to three miles broad. Thermopylæ has won an eternal celebrity as the scene of the heroic death of Leonidas I. (q.v.) and his three hundred Spartans in their attempt to stem the tide of Persian invasion (B.C. 480). But he was betrayed by Ephialtes, a Thessalian, into the hands of the Persians, who advanced by a path over the mountains, and fell upon his rear. In B.C. 279 a large army of Greeks held Brennus and his Gauls at bay until they also found a path over the mountains. The Greeks, however, escaped on their fleet. Again, in B.C. 191, Antiochus endeavored to check the Romans at this point, but Cato stormed the fortress which commanded the path, and, aided by a frontal attack of the main force, routed the Syrian army.

THERMOSCOPE (from Gk. *θέρμη*, *thermē*, heat + *σκοπεῖν*, *skopein*, to look). A device to indicate relative temperatures by making use of the property possessed by substances of changing their state or volume under the influence of heat. Thus, knowing the fusing-point of a solid, we are enabled to determine whether a certain temperature is above or below the temperature at which it melts, while with a liquid we have two such points, namely, the temperature of vaporization and that of solidification. Such substances form what are termed discontinuous intrinsic thermoscopes, and by virtue of their intrinsic properties enable us to ascertain relative temperatures. For example, butter would serve as such a thermoscope, since by its melting it would indicate that the temperature of the room was above its point of fusing. Likewise we soon use other substances, including alloys, for this purpose, and extend our observations over a considerable range. If the substance used as a thermoscope possesses the property of continuously varying in its condition with an increase or diminution of temperature, so as to afford a continuous indication over a given range of temperature, as is the case with mercury, then we have what is known as a continuous thermoscope. If this is so arranged that it can be graduated according to some previously arranged scale, it then forms a thermometer. The camphor thermoscope is a sealed tube of glass containing a solution of camphor in alcohol, which indicates changes in temperature by its appearance. At high temperature the liquid is clear, as the camphor is entirely dissolved, but with low temperature it crystallizes and appears as a white fleecy mass. This instrument does not, as is commonly supposed, indicate changes either in pressure or electrical condition of atmosphere.

THERMOTROPISM (from Gk. *θέρμη*, *thermē*, heat + *τροπή*, *tropē*, a turning, from *τρέπειν*, *trepein*, to turn). Primarily, the sensitiveness of plant organs to the direction of radiant heat which causes them to bend (positively) toward or (negatively) away from its source. The same organ may be both positively and negatively thermotropic under different conditions. It is often difficult to separate this phenomenon from that of heliotropism (q.v.), with which it is parallel, but there are several well-established cases of thermotropism of roots and shoots of higher plants. If shoots of germinating maize or mustard seeds be placed in the dark and at the right distance from a suitable heat-radiating surface, they will bend according to the intensity of the heat either toward or away from the radiator. The term has also been used incorrectly to denote movements due to a change in temperature, such as those of the sepals and petals in the opening and closing of the tulip flowers. Many leaves show this response also, e.g. those of rhododendron. All these reactions, however, are not examples of true thermotropism, but are rather comparable to those responses of leaves to variations in light intensity which are embraced by the terms nyctitropic movements and paraheliotropism.

THÉROIGNE DE MÉRICOURT, tā́'rwăn'y' de mā́'rē̍'ko͞or' (1762-1817). A prominent figure during the French Revolution. She was born at Marcourt near Liège. Her true name was Anne Josèphe Terwagne. In 1789 she went to Paris, and entered upon a life of shame. Knowing all the leaders of the Revolution, she became an enthusiastic Republican and the commander of the mobs of women that played such a conspicuous part in the dramatic days of the Revolution. Armed with sabre and pistol, this Amazon of Liberty, as she was called, led her feminine battalions against the Bastille July 14, 1789, to Versailles on October 5-6 of the same year, and after her return from an Austrian prison was prominent during the disturbances on June 20 and August 10, 1792. In May, 1793, while defending the Girondist Brissot, her lover, she was seized, stripped, and whipped by a mob of maddened women. She became insane from this treatment, and spent the rest of her life in La Salpêtrière.

THEROMORPHA (Neo-Lat. nom. pl., from Gk. *θήρ*, *thēr*, wild beast + *μορφή*, *morphē*, form). A name applied to several widely dissimilar groups of fossil reptiles which possess certain common characters of skull, vertebræ, limb-girdles, and digital formula. Another ordinal name, *Anomodontia*, is often used synonymously with Theromorpha. The theromorphs, together with the turtles and plesiosaurs, compose the great reptilian division *Synapsida* (Osborn), characterized by certain mammal-like features of the skull and the mammalian digital formula. All known theromorph remains have been found in the rocks of Permian and Triassic age. They were for the most part animals of rather heavy build, adapted to land life and sluggish habit, though one group appears to have been marine. The following suborders are commonly recognized:



SKULL OF A THERIODONT (*Galesaurus*).

(1) Cotylosauria or Pareiasauria. A group of reptiles having a solid cranial roof with a large pineal foramen, and usually with teeth on the vomer, pterygoid, and palatine bones. It is probable that these forms stand closest to the ancestral Stegocephalia or armored Amphibia. The best-known example is *Pareiasaurus*, from the Karoo beds of South Africa, a heavily built land animal, eight feet long. (2) Theriodontia. A group which closely resembles mammals in the differentiation of the teeth into incisors, canines, and molars, and in certain features of the skull. Most genera have a distinctly carnivorous dentition, but a few, the Gomphodontia, have crushing molars. Nearly all the known theriodonts are from the South African Trias. Cynognathus, in which the skull is remarkably dog-like, equaled the black bear in size and general proportions. Many zoölogists believe that mammals have been derived from theriodonts. (3) Dicynodontia. Land reptiles from the Trias of Scotland and South Africa, known chiefly from the skull, which is greatly modified, having the teeth entirely wanting, as in Udenodon, or reduced to a single pair of large tusks in the upper jaw, as in Dicynodon and Gordonia. (4) Placodontia. Named from the large, knob-like crushing teeth. Placodus, the first named genus from the marine Trias of Germany, was long known only from these teeth. The genus Placochelys is known to have had a carapace composed of a mosaic of small plates. The view held by some paleontologists that placodonts are ancestral to turtles is untenable.

THERSITÉS, thĕr-sī'tē̍z (Lat., from Gk. Θερσίτης). In the *Iliad*, the ugliest and most impudent talker among the Greeks assembled before Troy. He is represented as reviling Agamemnon and Achilles, and is beaten by Odysseus for his insolence. Later writers said he was a son of Agrios, brother of Œneus, and was slain by Achilles, whom he had mocked after the death of Penthesilea.

THESAURUS. See DICTIONARY.

THESE'UM (Lat., from Gk. Θησεῖον, *Theseion*, building sacred to Theseus, from Θησεύς, *Theseus*, Theseus). An heroön or sanctuary of the hero Theseus (q.v.). The most celebrated one was that at Athens, which seems to have stood near the centre of the city, to the northwest of the Acropolis, and not far from the Stoa of Attalus. Built about B.C. 473, when Cimon brought the reputed bones of Theseus from the island of Scyros to Athens, it was decorated by Polygnotus and Micon with paintings representing Theseus's descent into the sea to Amphitrite, his battle with the Amazons, and the battle of the Centaurs and the Lapithæ. It was an important sanctuary, and the sacred precinct in which it stood was an asylum for fugitive slaves, or those who were oppressed. Here, too, the thesmothetæ drew lots for the choice of the archons.

The name is commonly applied to the best preserved temple in Greece, which stands on a low hill (Colonos Agoraios) to the west of the ancient Agora of Athens, though the true Theseum must have been on the east. The building is a Doric hexastyle peripteros with thirteen columns on the side, and owes its preservation to its transformation in early Christian days to a church of Saint George. Its present name rests only on an anonymous description of Athens from the end of the fifteenth century, and is directly opposed to all the ancient testimony. The correct name of the building is still uncertain. It has been identified with the temple of Ares, of Hercules in Melite, of Apollo Patroös, and of Hephæstus and Athena Ergane; the last being the most plausible. It is certainly a work of the Periclean age, and probably somewhat later than the Parthenon, though on this point good authorities differ. The exterior of the building has been comparatively little harmed by the course of time, but the interior has been remodeled to serve as a church. A few years ago it was a museum, and it still serves as a storeroom for unimportant antiques. Of the sixty-eight metopes only eighteen are sculptured, namely, the ten across the eastern end, representing labors of Hercules, and the four adjoining metopes on each side, representing deeds of Theseus. Across the ends of the cella an Ionic frieze replaces the Doric, and at the eastern end is prolonged beyond the walls of the cella to the beams of the peristyle. The shorter west frieze contains the contest of the Centaurs and the Lapithæ, while the east frieze represents a battle in the presence of six seated gods, but no sure interpretation of its meaning has been reached. The sculptures which originally adorned the pediments have disappeared.

Bibliography. The literature is very extensive, but the following are among the more important or accessible works: Stuart and Revett, *Antiquities of Athens*, vol. iii. (London, 1762-1816); Wachsmuth, *Die Stadt Athen im Altertum* (Leipzig, 1874-90); Graef and Baumeister, s. v. "Theseion," in Baumeister's *Denkmäler der klassischen Altertumswissenschaft* (Munich and Leipzig, 1889); Harrison and Verrall, *Mythology and Monuments of Ancient Athens* (London, 1890); Frazer, *Pausanias*, vol. ii (ib., 1898); B. Sauer, *Das sogenannte Theseion und sein plastischer Schmuck* (Leipzig, 1899); Reinhardt, *Gesetzmässigkeit der griechischen Baukunst*, vol. i. (Stuttgart, 1903).

THESEUS, thē'sē-ŭs *or* thē'sūs (Lat., from Gk. Θησεύς). The national hero of the Athenians, and, next to Hercules, the most famous character of Greek legend. His story owes its prominence largely to the influence of Athens in Greek art and literature, for in the epic Theseus has but small place. A doubtful verse in the *Iliad* associates him, not with Athens, but with the Thessalian Lapithæ and their conflict with the Centaurs, and he appears in the late passage of the *Odyssey* which describes the visit of Odysseus to the lower world. The early art knows only the slaying of the Minotaur, and seems to have borrowed the type from Mycenæan tradition. Though a thoroughly satisfactory analysis of the Theseus legend is still lacking, it seems probable that it was closely connected with the Marathonian tetrapolis, then crossed to Trœzen, whence it returned to Athens. Its first great development occurred under the Pisistratidæ, when Theseus was recognized as the uniter of Attica, and the type of the gentle and just ruler, beloved of his people, a sort of mythical predecessor of Pisistratus. Soon after the Persian wars the democracy transformed him into its real founder, who protected the injured from other States and forced Creon and Eurystheus to observe justice and humanity. At this time (B.C. 473) his reputed bones were brought from Scyros to Athens with great pomp by Cimon, and an heroön, the Theseum (q.v.), was erected. In origin, Theseus is probably best considered as a beneficent deity, a local parallel to Hercules, who slays monsters and gives peace and security to his worshipers, but, like other nature-divinities, descends into the lower world, and is subject to the powers of death. Legend made Theseus the son of Æthra, daughter of Pittheus, King of Trœzen. His father was commonly said to be Ægeus, King of Athens, though early legend recognized the paternity of Poseidon. (The two versions are really the same, Ægeus being originally a name of the sea-god.) He was brought up at Trœzen, and, on reaching manhood, proceeded to his father's residence at Athens. On his way thither across the isthmus he destroyed robbers and monsters who rendered the route unsafe for travelers, such as Periphetes, Sinis, the Crommyonian sow, Sciron, Cercyon, and Procrustes. (See Procrustes.) On his arrival in Athens he found the sorceress Medea living as his father's wife, and only escaped her attempt to poison him through Ægeus's timely recognition of his own sword and sandals, which he had left in Trœzen for his son. Medea fled and Theseus overcame Pallas and his sons, who attempted to secure the royal power. He also bound the Marathonian bull, which was ravaging the Tetrapolis. Then came the expedition to Crete to deliver Athens from its tribute to the Minotaur (q.v.) of seven youths and seven maidens. On this voyage he proved his descent from Poseidon by bringing back the ring of Minos from the depths of the sea, and by the help of Ariadne (q.v.) killed the Minotaur. On his way back he founded a festival of Apollo at Delos, to which the Athenians ever after sent an annual embassy.

As his father, Ægeus, had destroyed himself in the belief that his son had perished in Crete, Theseus now became King of Athens, and consolidated into one State the twelve independent communities of Attica, in celebration of which event was instituted the festival of the Panathenæa. That the festival commemorated such an event is probable, but this does not prove the historical personality of Theseus. Legend also told of his friendship for the Lapith King Pirithoüs, at whose wedding he fought the Centaurs (see Lapithæ), with whose aid he carried off Helen to Aphidna, and with whom he finally descended to the lower world that his friend might carry off Persephone as his bride. Pirithoüs never returned, and Theseus remained in captivity till Hercules, on his quest for Cerberus, prevailed on Hades to release him. Athenian legend also told of the great invasion of the Amazons in his reign, of the straits to which they reduced the Athenians, and of their final rout by the hero, who secured as wife their queen, Antiope or Hippolyta, by whom he had a son, Hippolytus. Later he married Phædra (q.v.), daughter of Minos and sister of Ariadne. It was said that during his absence in the lower world Menestheus, with the help of Castor and Pollux, who had come to rescue Helen, made himself King, and that Theseus, unable to reëstablish his authority, went to Scyros, where he was murdered by Lycomedes. Much in the character of Theseus as it appears in legend seems due to Athenian desire to represent their national hero as the embodiment in heroic times of the virtues on which they prided themselves in historic times, and which the great heroes of the national epic often conspicuously lacked.

THES'MOPHO'RIA. See Greek Festivals.

THES'MOPHOR'IAZU'SÆ (Lat., from Gk. Θεσμοφοριάζουσαι, *Thesmophoriazousai*, women celebrating the Thesmophoria). A comedy by Aristophanes (about B.C. 410). It is aimed against Euripides for his innovations and his dislike for women, on account of which he is dragged to justice by women taking part in the Thesmophoria.

THESPE'SIUS (Neo-Lat., from Gk. *θεσπέσιος*, divinely, sounding divine). An herbivorous ornithopod dinosaur, allied to Hadrosaurus and Iguanodon, which it closely resembles, found fossil in the Upper Cretaceous beds of Colorado, Wyoming, and Montana. It was a large animal, 25 to 30 feet long and 10 to 15 feet high, with medium-sized head, small, almost useless fore limbs, and well-developed three-toed hind limbs upon which it ran in bipedal motion, using its heavy tail to balance the forward portion of the body. Another name for this creature is Claosaurus. A complete skeleton of this animal, mounted as if in the act of running, is in the museum of Yale University. Consult: Marsh, "The Dinosaurs of North America," *Annual Report of the United States Geological Survey*, vol. xvi., part i. (Washington, 1896); Beecher, "The Reconstruction of a Cretaceous Dinosaur, Claosaurus annectans Marsh," in *Transactions of the Connecticut Academy of Sciences*, vol. xi. (New Haven, 1902). See DINOSAURIA.

THES'PIÆ (Lat., from Gk. Θεσπειαί, *Thespeiai*, Θεσπιαί, *Thespiai*), or THESPIA. An ancient town in Bœotia, near the foot of Mount Helicon. Like Platæa, it was hostile to the Theban pretension to supremacy in Bœotia, and these two were the only Bœotian cities which refused to give earth and water to the heralds of Xerxes and did not side with the Persians at the battle of Salamis. Seven hundred Thespians joined Leonidas at Thermopylæ, and were slain in defending the pass. Thespiæ was burned by Xerxes, but was subsequently rebuilt. Shortly after the battle of Leuctra (B.C. 371) it was again destroyed, and was afterwards a second time restored. Here was preserved a marble statue of Eros by Praxiteles. On account of the vicinity of Mount Helicon to the town, the Muses were called *Thespiades*. The site of the ancient town was near the modern village of Eremokastro.

THES'PIS (Lat., from Gk. Θέσπις). A native of the Attic deme of Icarus in the sixth century B.C., called the father of Greek tragedy. He introduced an actor to reply to the leader of the chorus, who before had recited the adventures of Dionysus and had been answered by the chorus, and thus made an important step toward the drama.

THESSALONIANS, EPISTLES TO THE (Gk. πρὸς Θεσσαλονικεῖς, sc. ἐπιστολή, *pros Thessalonikeis*, to the Thessalonians, sc. *epistolē*, epistle). Two letters in the New Testament, purporting in their opening passages of greeting to have been written by Paul, and generally so accepted by scholars. They were written in Corinth during Paul's first visit to that city in the year 50-51 within a few months of each other, and, if a later date for Galatians be accepted, are the earliest of the preserved writings of the Apostle. They were sent to the Christian community of Thessalonica, where Paul had but recently preached the gospel, in order to comfort his people in the persecution they were suffering, the beginnings of which had driven Paul and his companions from the city. They are consequently marked by an absence of doctrinal discussion. In fact, apart from a short apologetic passage in the first Epistle, a brief statement in the same Epistle regarding the advent of Christ, and a more elaborated one in the second Epistle as to the coming of the Day of the Lord, involving a declaration of the character and work of the 'Man of Sin,' they may be considered purely pastoral letters whose concern is with the readers' practical religious needs—and even in these excepted passages the spirit of the writer is essentially that of the pastor.

Both Epistles were rejected by the Tübingen School (1845) and are disowned to-day by the radical Dutch School (1882), the force of whose criticism, however, is largely broken by the general negative position which they maintain toward all of Paul's writings. At the same time there is considerable critical debate regarding the Paulinity of the second Epistle—due to the difficult passage in chapter ii. regarding the 'Man of Sin'—a passage the subject of which is a most unusual one with Paul and the meaning of which in itself is most obscure. It is argued on the one side that the unusual character of this passage in Paul's Epistles—no parallel to it being found in his writings—the agreement of the picture which it presents with any one of several situations late in the century, particularly with the situation occasioned by the expected return of Nero, and the evident literary dependence of the rest of the Epistle on I. Thessalonians, all show the author to have been some one after Paul's day, who, apparently out of a desire to quiet tendencies to disorder consequent upon expectations of the immediate coming of Christ, described the events which must necessarily precede that coming, writing in the name of Paul in order to secure authority for his statements, and modeling his production on Paul's Thessalonian letter, the contents of which were more or less of an eschatological character.

On the other side, it is asserted that when consideration is given to the fact that recent investigations in the field of apocalyptic literature have shown the existence among the Jews of a popular anti-Messiah legend, having its source in pre-exilic times and coming down through various stages of development to the times of the Christian Church, and when it is remembered that this popular belief is made use of in various ways by Jesus Himself (e.g. in His eschatological discourse in Mark xiii. and parallels) as well as by some of the Apostolic writers (cf. e.g. I. John ii. 22), it cannot be held an unlikely thing for Paul also to make the use of it which we find in this passage, though such usage does not occur again in his writings. On such a theory it is maintained that the picture here presented would not need to be applied to any definite person, any more than would the corresponding pictures in the other New Testament writings. They would all refer rather to personified principles of evil hostile to Christ and His religion, or to principles impersonated generally in the enemies of Christianity. In any event, it is contended, nothing can be made out of the resemblance of the second Epistle to the first which would show a greater dependence of the latter upon the former than would be natural for Paul in writing two letters to the same people within a few months of each other. The contention that in the second Paul has reversed his belief in a sudden coming of Christ within the limits of his own lifetime which he expressed in his earlier letter, is answered by saying that in I. Thessalonians the return of Christ is presented as unexpected only to those who are evil, while the perspective given to that coming in II. Thessalonians does not necessarily carry it beyond the limit of life to which Paul might naturally look forward.

Bibliography. *Commentaries:* Schmidt (Berlin, 1885); Schmiedel, in *Handkommentar zum Neuen Testament* (Freiburg, 1893); Bornemann, in *Meyer-Kommentar über das Neue Testament* (Göttingen, 1894); Zöckler, in *Strack und Zöckler Kommentar* (Munich, 1894); Goebel (Gotha, 1887); Zimmer (Herborn, 1891); id., *Textkritischer Apparat und Kommentar* (Gotha, 1893); Jowett (London, 1894); Lightfoot, *Notes on the Epistles of Saint Paul* (London, 1895). *Introductions:* B. Weiss (Eng. trans., Edinburgh, 1888); Holtzmann (Freiburg, 1892); Godet (Eng. trans., ib., 1894); Salmon (London, 1894); Zahn (Leipzig, 1900); Moffatt, *The Historical New Testament* (New York and Edinburgh, 1901); Jülicher (Tübingen and Leipzig, 1901). *Discussions:* Baur, *Paulus* (Eng. trans., London, 1872-75); Thackeray, *The Relations of Saint Paul to Contemporary Jewish Thought* (London, 1900); Stanton, *The Jewish and Christian Messiah* (Edinburgh, 1886); Klöpper, *Der zweite Brief an die Thessalonicher* (Königsberg, 1889); Weizsäcker, *Das apostolische Zeitalter* (Eng. trans., New York, 1894); Spitta, *Zur Geschichte und Litteratur des Urchristentums* (Göttingen, 1893); Clemen, *Die Einheitlichkeit der paulinischen Briefe* (Göttingen, 1894); Bousset, *Der Antichrist* (Eng. trans., London, 1896); Wrede, *Die Echtheit des zweiten Thessalonicherbriefes* (Leipzig, 1903).

THES'SALONI'CA (Gk. Θεσσαλονίκη). An ancient Greek city, situated on the northeastern shore of the Thermaic Gulf, in Mygdonia. Tradition told of an early city, Eumathia or Halia, on this site, but the historical Greek city appears in Herodotus and Thucydides as Therme, a name due to the presence of hot springs in the neighborhood. The exact origin of the later name, which appears in Polybius, is uncertain. Most probable is the story of Strabo, that the town was enlarged and in part rebuilt in B.C. 315 by Cassander, who gave it the name of his wife, Thessalonica, the daughter of Philip of Macedon. Its strong fortifications enabled it to repel a Roman attack, and after the Roman conquest of Macedonia (B.C. 146) it became one of the chief cities of the province. Situated on the great Via Egnatie, it attracted a large trade by land and sea, while the support given to Mark Antony and Octavian seems to have made it a free city. It contained a considerable Jewish colony, and was the seat of a Christian church, founded by the Apostle Paul. It was severely punished by the Emperor Theodosius, when 7000 citizens are said to have perished because of an uprising, but appears in the later history of the Empire as a strong defense against the Goths and Slavs. It was, however, captured by the Saracens in A.D. 904, by the Normans in 1185, and finally by the Turks in 1430. For the modern city, see Saloniki.

THES'SALY (Lat. *Thessalia*, from Gk. Θεσσαλία, Attic Θετταλία, *Thettalia*, Thessaly, from Θεσσαλός, *Thessalos*, Attic Θετταλός, *Thettalos*, Thessalian). The largest division of ancient Greece, bounded on the north by Macedonia, from which it was separated by the Cambunian Mountains, on the west by Epirus. with the Pindus range as a boundary, on the east by the Ægean Sea, and on the south by the range of Œta and the Maliac Gulf. The southern boundary is not very definite. Though Achæa, Ænis, and Malis can properly be included in the general term, Thessaly proper only reaches to the range which extends from Pindus to the head of the Pagasæan Gulf. Others, who include Achæa (Phthiotis), call Mount Othrys the southern boundary. Thessaly proper is a vast plain shut in on every side by mountains; on the north and west by those already named, and on the east by mounts Pelion and Ossa, the only opening being the Vale of Tempe in the northeast between Ossa and Olympus. The plain of Thessaly is said at one time to have been a vast lake, the waters of which found an outlet by the Vale of Tempe. This plain is drained chiefly by the river Peneus (now Salambria) and its tributaries, and is the most fertile in all Greece, having produced in ancient times abundance of corn and cattle, and a breed of horses considered the finest in Greece, and still yielding large crops.

History. In the epic, Thessaly seems inhabited by a number of tribes, among whom are the Pelasgians of the Peneus valley, and the Achæans and Hellenes in the south. During the migrations that marked the period between the heroic age and that of historical Greece, tribes from the mountains of Epirus and the north pushed into this region, driving out or subjugating the inhabitants. Part of these latter migrated to Asia Minor, where they colonized Æolis. The Bœotians, too, were said to have been crowded out by the new-comers, but it is probable that Bœotians and Phocians were really the vanguard of the invaders. The conquerors settled in the rich lands of the Peneus valley, reducing the original owners to the position of serfs of the soil, who cultivated the land on their own account, paying a fixed proportion to the owners. These Penestæ could not be sold out of the country, nor put to death without a trial. The Thessalians themselves constituted a landed nobility gathered about the cities. In these cities a few great families exercised almost unlimited power, among whom in the sixth and fifth centuries B.C. the most famous were the Aleuadæ of Larissa and the Scopadæ of Crannon and Pharsalus. The league between the cities was a loose one, and there was no supreme authority, except so far as from time to time some family obtained a leading position. Four districts were recognized from early times, Hestiæotis at the north, Thessaliotis and Pelasgiotis in the centre, and Phthiotis in the south, each of which in the fourth century was led by a polemarch. A general council seems to have met when any occasion calling for united action arose, and in war a general called the tagus (ταγός) was chosen as commander-in-chief. The league was thus essentially military, but there must have been a well-established system, for in the sixth century B.C. the Thessalians were threatening to extend their power over Southern Greece, and seem at one time to have occupied Phocis. Their strength was in the cavalry, composed of the nobles, to which were added peltasts or light infantry, composed probably of Penestæ.

The Thessalians soon brought under their rule the mountainous districts surrounding the Peneus valley, occupied by the Perrhæbians, Magnetes, and Achæans of Phthiotis, who as independent tribes had places in the Amphictyonic Council, but later paid tribute and military service to the Thessalians. The other border tribes, the Dolopians, Ænianians, and Malians, were also in actual, if not nominal, dependence. The growing power of Thessaly received a severe check at the hands of the Phocians, and after the Persian wars it played but a small part in Greek history, until in the fourth century B.C. for a brief period it was united under the rule of the able tyrant of Pheræ, Jason, who secured his election as tagus, collected a strong force of cavalry and mercenary infantry, organized a fleet, and at the time of his assassination (B.C. 370) seemed likely to anticipate the career of Philip of Macedon. His successors were bloodthirsty tyrants and the united Thessaly was quickly dissolved, though the old district organization was revived under the influence of Pelopidas and the Thebans. During the Sacred War the country was at one time occupied by the Phocians, but in B.C. 352 passed under Macedonian control, and in B.C. 344 Philip was elected archon (the new name of the tagus) of Thessaly and the country was virtually united to Macedon. Thessaly remained subject to the Macedonian kings till the victory of Flamininus, at Cynoscephalæ, in B.C. 197, placed it under the protection of Rome. Under the Roman emperors Thessaly was united with Macedonia, but after Constantine it was a separate province. In 1204, with other portions of the Eastern Empire, it came under the dominion of the Venetians, and in the fourteenth century it was conquered by the Turks. The southern part of Thessaly was freed from Turkish rule at the time of the Greek Revolution. The bulk of the region was ceded to Greece in 1881 as a result of the demand of the Great Powers made on the conclusion of the Russo-Turkish War. A small mountainous district in the north still belongs to Turkey. In 1897 Thessaly was the principal seat of the Greco-Turkish War, the Turks forcing the Milouna and Raveni passes, in the Olympian range, on the frontier, and finally occupying Larissa. Thessaly comprises the nomes of Phthiotis, Larissa, Karditsa, Trikkala, and Magnesia.

THET'FORD. A municipal and Parliamentary borough and market town in Norfolk, England, on the Little Ouse, 79 miles northeast of London (Map: England, G 4). It has an eventful history and in the reign of Edward III. contained eight monasteries and twenty churches. Its most important relic of antiquity is the castle hill, a mound 1000 feet in circumference and 100 feet high, probably the largest Celtic earthwork in England. Population, in 1891, 4247; in 1901, 4600.

THE'TIS (Lat., from Gk. Θέτις). In Greek legend, the most famous of the Nereids (q.v.). She was the daughter of Nereus and the Oceanid Doris, and was loved by both Zeus and Poseidon. When Themis prophesied that her son would be mightier than his father the gods desisted from their suit, and compelled her to wed Peleus (q.v.), who, in spite of her frequent transformations, held her fast until she returned to human form. By Peleus she became the mother of Achilles (q.v.). In Homer she is represented as living with her father in the depths of the sea. She was said to have protected Dionysus when he fled from Lycurgus, and to have tended Hephæstus when he was hurled from heaven by Hera.

THEURIET, tē̆'rē'ȧ', ANDRÉ (1833—). A French poet and novelist, born in Marly-le-Roi (Seine-et-Oise). He studied law in Paris, was admitted to practice in 1857, and soon afterwards accepted a position in a department of the Ministry of Finance. Already, however, his interests had turned to literature. His favorite field is the provincial idyll of humble life. His first poems were gathered as *Le chemin des bois* (1867). They show close observation of nature. The human figures are hewers of wood, whose hard struggles the poet describes truthfully and with feeling. *Le bleu et le noir, poèmes de la vie réele* (1876), is among his best volumes of verse. Theuriet describes Breton landscapes with charming and life-like touches. Of about sixty volumes of fiction the best are *Le mariage de Gérard* (1875) and *Amour d'automne* (1888). There may also be mentioned: *Reine des bois* (1890); *La Chanoinesse* (1893); *Frida* (1900); and *La sœur de lait* (1902). The nearest analogue to the best of Theuriet's fiction is the pastoral work of George Sand, but his style, marked by occasional archaisms, more nearly resembles that of Bernardin or of Rousseau. In the drama Theuriet wrote *Jean-Marie* (1871); *La maison des deux Barbeaux* (1885); and *Jours d'été* (1901). In 1896 he was elected to the Academy.

THÉVENET, tȧv'nȧ', MARIUS (1845—). A French politician, born in Lyons. He studied law and gained great distinction at the bar of his native city, and was elected a Deputy from the Department of the Rhône in 1885. He was appointed Minister of Justice and Public Worship February 22, 1889, in the second Cabinet of Tirard. He displayed great activity in this position in the suppression of Boulangism, and vigorously prosecuted Paul Déroulède as chief of the League of Patriots. He was reëlected Deputy in 1889, lost his portfolio at the fall of the Ministry, March 17, 1890, and in 1892 was elected Senator from the Department of the Rhône. He was implicated in the Panama scandal, but escaped prosecution. His militant attitude in the Dreyfus affair caused him to fail of reëlection to the Senate in 1900.

THIBAUDEAU, tē'bō'dō', ANTOINE CLAIRE, Count (1765-1854). A French statesman and historian, born at Poitiers. The outbreak of the French Revolution found him a lawyer in his native city. He was elected to the Convention in 1792, joined the party of the Mountain, and voted for the death of the King. In 1796 he was chosen president of the Council of Five Hundred. He abandoned his extreme views, opposed the *coup* of the 18th Fructidor (September 4, 1797), and was saved from deportation by the intervention of friends. After the *coup* of the 18th Brumaire (November 9, 1799) he was made Prefect of Bordeaux and held the position of Councilor of State till 1808. In that year he became prefect of the Department of Bouches-du-Rhône. He helped in the elaboration of the Code and was made a Count of the Empire in 1809. On the second return of the Bourbons he was proscribed as a regicide and lived abroad till the Revolution of 1830. He was made a Senator by Napoleon III., and died in Paris, March 8, 1854. He wrote: *Mémoires sur la Convention et le Directoire* (1824); *Mémoires sur le Consulat* (1827); *Histoire générale de Napoléon Bonaparte* (1828); *Le Consulat et l'Empire* (1835); *Histoire des Etats Généraux et des institutions représentatives en France* (1843). His autobiography appeared in 1875.

THIBAULT, tē'bō', JACQUES ANATOLE. See FRANCE, ANATOLE.

THIBAUT or **THEOBALD I.** (1201-53), King of Navarre from 1234 to 1253, originally Count of Champagne. He was born in France and educated at the Court of Philip Augustus. He is said to have been in love with Blanche of Castile, Queen of Louis VIII., and when Louis died, in 1226, some suspected that he had been poisoned by Thibaut. The latter at first allied himself with the league of nobles against Blanche, Regent during the minority of her son, but was soon won over by her. On the death of his uncle, Sancho the Strong of Navarre, in 1234, he succeeded to that kingdom. He went to Palestine in 1239, but was badly defeated at Gaza. He was a friend of literature and a *trouvère* of no mean order, Dante and Petrarch being among his admirers. His poems were first published by Lévesque de la Ravallière (2 vols., Paris, 1742), and have been republished several times since. Consult Delbarre, *Vie de Thibaut* (Laon, 1850).

THIBAUT, ANTON FRIEDRICH JUSTUS (1772-1840). A German jurist. He was born at Hameln, and studied at Göttingen, Königsberg, and Kiel, at which latter university he was appointed professor of civil law in 1798. From 1802 to 1806 he was professor at Jena, where he became a friend of Goethe and Schiller. In 1806 he went as professor of civil law to Heidelberg, where he remained until his death. He published *Theorie der logischen Auslegung des römischen Rechts* (1799); *Ueber Besitz und Verjährung* (1802); *System des Pandektenrechts* (1803); *Zivilistische Abhandlungen* (1814).

THIBET, tĭb'ĕt *or* tĭ-bĕt'. A dependency of China. See TIBET.

THIBODEAUX, tē'bō-dō'. A town and the parish seat of Lafourche Parish, La., 47 miles west by south of New Orleans, on the Bayou Lafourche, and on the Southern Pacific Railroad (Map: Louisiana, E 4). It derives considerable commercial importance from its situation in a fertile section producing extensively rice and sugar-cane. Mount Carmel Academy is here. The water-works and the electric light plant are owned by the municipality. Population, in 1890, 2078; in 1900, 3253.

THICKET (AS. *þiccet*, from *þicce*, thick, OHG. *dicchi*, Ger. *dick*, OIr. *ting*, OWelsh, Bret. *ten*, Welsh, Corn. *tew*, thick, and with Ger. *dicht*, Dan. *tæt*, Eng. *tight*). A plant society dominated by shrubs. In regions of great rainfall thickets may be generally regarded as forerunners of forests, but in many arid regions while present conditions remain they are usually the ultimate type of vegetation. Various names have been given to the xerophytic thicket areas. Those of the Southwestern United States are called chaparral; those of the Mediterranean region, maqui; those in Southern South America, espinal; in Australia, scrub. They all agree in having a shrubby, thorny, stunted aspect.

THICKHEAD FLY. Any one of the flies of the family Conopidæ, a group comprising species with large and conspicuous heads. They are rather large insects, but are generally slender and with a stalked abdomen. They frequent flowers and their larvæ are parasitic, chiefly upon bumblebees and wasps, and also more rarely upon grasshoppers. The eggs are probably laid upon the body of the host, and the larvæ as a rule live in the abdominal cavity. About thirty species occur in the United States.

THICK-KNEE. A large, plover-like shore bird of the Old World, representing the family Œcnemidæ, of which several species are known, all characterized by the enlargement of the tibiotarsal joint. The familiar one of Western Europe (*Œdicnemus œdicnemus*) is known in Great Britain as the 'great' or 'stone' or 'Norfolk' plover, or 'stone-curlew,' and is a favorite among gunners. It is largely nocturnal, and its mellow whistling cry at twilight is a delightful sound along the sea-beaches. For illustration, see Plate of BUSTARDS.

THIELMANN, tēl'män, JOHANN ADOLF, Baron (1765-1824). A Prussian general, born at Dresden. He entered a Saxon regiment in 1782, served through the Rhine campaigns, and was engaged on the side of Prussia in the battle of Jena in 1806. He was next sent by Saxony as Ambassador to Napoleon I.; became his ardent admirer, and did much to bring about the Franco-Saxon Alliance. He served with the French as major in the campaign of 1807; fought at Friedland in that year, was made major-general, and operated against the Austrians in Saxony. In the Russian campaign of 1812 he commanded a brigade of cavalry and for exceptional bravery in the battle of Borodino was made a baron. As commander of Torgau in the early part of 1813 he entered into communications with the Allies, and on being ordered by the Saxon King to deliver the town to the French, resigned his post and went over to the enemy. He was given command of a Saxon corps which participated in the invasion of France in 1814. He next joined the Prussian Army (1815), and led the Third Army Corps at Ligny and at Wavre, contributing materially to the victory at Waterloo.

THIELT, tēlt. A town in the Province of West Flanders, Belgium, 20 miles southwest of Ghent (Map: Belgium, B 3). It has an ancient cloth hall and belfry, and manufactures cotton and woolen goods, linen, leather, etc. The town was at the zenith of its prosperity during the Middle Ages, but in 1383 it was almost totally destroyed by fire, and has never regained its importance. Population, in 1900, 10,727.

THIERRY, tyā'rē', AMÉDÉE (1797-1873). A French historian, born at Blois, brother of the following. He was associated with the Romantic School and especially with its journal, the *Globe*, and obtained a clerical post under the Government in recognition of his contribution to the history of Guienne in 1825. His *Histoire des Gaulois*

(1828) won for him a professorship of history at Besançon, but his teaching proved unpalatable to the reactionary Government of Charles X. and his course of lectures was suspended by official order. The Revolution of 1830 brought to him the Prefecture of Haute-Saône, which he held till 1838, when he received the office of *Maître des requêtes.* In 1860 he was appointed Senator of the Empire. He was advanced to high office in the Legion of Honor and elected member of the Academy of Inscriptions in 1841. The most important of his books are: *Histoire de la Gaule sous l'administration romaine* (1840-47); *Histoire d'Attila* (1856); *Tableaux de l'empire romain* (1862); *Récits de l'histoire romaine* (1860-64). He wrote also *Saint-Jérôme* (1867) and *Chrysostome et Eudoxie* (1873).

THIERRY, Augustin (1795-1856). A French historian, born at Blois. He studied at the college of his native town and in the Ecole Normale at Paris, and became a teacher in a provincial school. In 1814 he went to Paris, and published his first work, *De la réorganisation de la société européenne.* Adopting the views of Saint-Simon, Thierry became his assistant for three years. In 1817 he joined Comte and Dunoyer as editors of the *Censeur Européen*, for which he wrote many articles, literary, political, and historical. In 1820 he became engaged on the *Courrier Français*, in which he published his *Dix lettres sur l'histoire de France.* He then turned almost exclusively to historical writing. His masterpiece, *L'histoire de la conquête d'Angleterre par les Normands*, was first published in 1825. His *Lettres sur l'histoire* appeared in 1827. In 1835 he published his *Dix ans d'études historiques.* In 1840 appeared his *Récits des temps mérovingiens*, which gained the great Gobert prize. His last publication was the *Essai sur l'histoire de la formation et de progrès du tiers-état* (1853). He edited for Guizot's *Collection des monuments inédits de l'histoire de France* the *Recueil des monuments inédits de l'histoire du tiers-état* (1849-56). He died May 22, 1856. His complete works were published in ten volumes (1856-60). His principal works have been translated into English.

THIERS, tē'âr'. The capital of an arrondissement in the Department of Puy-de-Dôme, France, 23 miles east-northeast of Clermont-Ferrand (Map: France, K 6). It is pleasantly situated on a hillside and consists of an upper and a lower town, the latter in a nearly sunless gorge (the Ville Noire of George Sand's novel of that name). The eleventh-century Romanesque Gothic Church of Saint Genès contains a noteworthy tomb of the thirteenth century, and the Church of Le Moûtier is an interesting Romanesque structure founded in the seventh century. The town is noted for its manufactures of cutlery, paper, and playing cards. Population, in 1891, 11,993; in 1901, 17,625.

THIERS, Adolphe (1797-1877). A French statesman and historian, born at Marseilles April 15, 1797. He was distinguished as a student at the lycée, and in 1815 he went to Aix to study law. There he formed a friendship with Mignet, the historian, in company with whom, after he had taken his degree as advocate (1818), he set off for Paris. Obtaining an introduction to Lafitte, he was enrolled among the contributors to the *Constitutionnel,* then the leading Liberal organ. His vigorous articles attracted attention to the young writer and won him a place in the most brilliant circles of the opposition. His *Histoire de la révolution française* (1823-27) gave him high rank as an historian. In January, 1830, he, with Mignet and Armand Carrel, established an able opposition paper, the *National.* Thiers in this journal waged unrelenting war against the Polignac Administration, whose publication of the celebrated Ordinances of July brought on the Revolution of 1830. Under the new Government of Louis Philippe Thiers was elected a member of the Chamber of Deputies, where he quickly made his mark as a debater, was appointed to a secretaryship in the Department of Finance, and in October, 1832, was made Minister of the Interior. During the next four years he acted as Minister of the Interior, Minister of Commerce and Public Works, and Minister of Foreign Affairs under various chiefs —Soult, Gérard, Mortier, and Broglie. His views with time became more conservative, and he repressed with severity the democratic uprisings against the new Government. In February, 1836, he became president of the Council and Minister of Foreign Affairs, but in August retired when the King refused to approve his plan for intervention in Spain and became the leader of the opposition. In March, 1840, he again assumed the Premiership and the Ministry of Foreign Affairs. He wished to support Mehemet Ali (q.v.) in his struggle against the Sultan, thus seeking to carry out the Napoleonic idea of a controlling influence by France in Syria and Egypt. He therefore refused to enter the alliance of Western powers formed for the preservation of the Ottoman Empire. (See Quadruple Alliance.) When Mehemet Ali was driven out of Syria, the popular irritation in France, fostered by Thiers, was great, but Louis Philippe refused to countenance armed interference, just as he had done in the Spanish matter, and accepted Thiers's resignation in October, 1840. The next five years Thiers spent in travel and in work upon his second history, *L'histoire du consulat et de l'empire* (1845-62). After 1846 he again became active in political affairs, and appeared more frequently in the Chamber as an eloquent spokesman of the opposition. In the Revolution of 1848 his part was that of a Moderate friendly to the Republic. He was banished after the coup d'état of 1851, but after a short residence abroad was permitted to return to Paris in 1852.

Thiers entered the Corps Législatif in 1863, and became the leader of the Liberal opposition, assailing the Imperial policies in a series of masterly speeches. He eloquently opposed the war with Prussia and predicted the defeat of France. After the collapse of the Empire he became the brains of the rehabilitation of France. He undertook diplomatic journeys to England, Russia, Austria, and Italy, on behalf of France—a self-imposed mission in which he was unsuccessful, but by which he acquired the gratitude of his countrymen. After the capitulation of Paris Thiers was elected to the National Assembly by twenty-six constituencies, and on February 17, 1871, became 'chief of the executive power' in the provisional Government, and as such negotiated the treaty of peace with Germany. Upon the outbreak of the war of the Commune (q.v.) Thiers took swift and energetic measures for the suppression of the movement. On August 31, 1871, the National Assembly conferred upon him the title of President of the Republic, making his term of office three years. Thiers, contrary to the expectations of the monarchical parties, became convinced of the need of a republican form of government, and in November, 1872, sent to the National Assembly a message urging the necessity of formulating an organic instrument of government for the Republic. The Clericals and Monarchists thereupon decided upon his fall, and as the result of a vote of censure passed on the Ministry, Thiers resigned May 24, 1873. He retired from public life for some time, but in 1876 was elected from Paris to the Chamber of Deputies, exercising his influence to the last in the defense of the Republic against the plots of the Monarchists.

Thiers was perhaps the most influential political leader France has produced. His figure was small, his appearance far from impressive, and his early attempts at oratory are said to have been ridiculous, but when he adopted the rapid, incisive style adapted to his personality he became one of the most effective speakers in France. His course as a statesman was guided by an intense love of country bordering on Chauvinism, and the conviction that the political power should repose in the hands of the middle class whose interests and tastes he so well represented. His histories are merely brilliant eulogies of the Revolutionary and Napoleonic ideals. He was elected a member of the Academy in 1834. Among the studies and sketches of Thiers may be noted Franck, *Vie de M. Thiers* (Paris, 1877); Mazade, *Monsieur Thiers, cinquante années d'histoire contemporaine* (ib., 1884); Rémusat, *A. Thiers* (ib., 1889; Eng. trans., London, 1892); Simon, *Le gouvernement de M. Thiers, 1871-73* (Paris, 1878; Eng. trans., New York, 1879); Goff, *The Life of Louis Adolphe Thiers* (trans. from the unpublished manuscript by Theodore Stanton, New York, 1879).

THIERSCH, tẽrsh, FRIEDRICH (1784-1860). An eminent German classical philologist and educator, born at Kirchscheidungen, near Freyburg-on-the-Unstrut, and educated at Leipzig and Göttingen. In 1808 Thiersch began his career as a teacher in the gymnasium at Göttingen, and in 1809 was called as a professor to the newly established gymnasium in Munich, where by his influence he became the founder of philological studies in Bavaria. The Philological Institute established by him was joined to the university in 1826, when the latter was removed from Landshut to Munich. As a result of his sojourn in Greece, in 1831-32, he published his important work *De l'état actuel de la Grèce*, etc. (1833). He was also a prime mover in establishing in 1837 regular meetings of German philologists and teachers. In 1848 he became president of the Bavarian Academy of Sciences. His published writings include: *Griechische Grammatik* (3d ed. 1828); *Pindar* (1820); *Ueber die Epochen der bildenden Kunst unter den Griechen* (2d ed. 1829); *Allgemeine Aesthetik in akademischen Lehrvorträgen* (1846); numerous monographs in the *Acta philologorum Monacensium* (1811-26); and many works on education. Consult his biography by his son Heinrich (Leipzig, 1866).

THIERSCH, LUDWIG (1825—). A German painter, born in Munich. He studied at the Munich Academy and became professor of painting at Athens in 1852. He returned to Germany in 1855. He was engaged by the Russian Government to fresco the Church of Saint Nicodemus. Similar commissions he executed for the Greek Church in Vienna, the chapels of the Grand Dukes Nicholas and Michael, and the Protestant Church of Saint Catharine at Saint Petersburg (1860-64). His easel pictures included a "Sakuntala" (1848); "Christ at Gethsemane" (1865); and "Christ in the Desert" (1874).

THIETMAR, tēt′mär, Bishop of Merseburg (975 or 976-1018). A German chronicler of aristocratic family, related to the Emperor Henry II. Thietmar was educated in the cloister schools at Quedlinburg and Magdeburg, was created in 1002 Provost of Walbeck, shared in the campaign of 1007 against Boseslav of Poland, and in 1009 was made Bishop of Merseburg. He passed the remainder of his life for the greater part at Court and sharing in campaigns against the Slavs. His *Chronicon* covers in eight books the period from Henry I. (the Fowler) to 1018, and at its close is almost a diary. It is rough and inflated with diction, credulous in narration, but shows an earnest search for truth, and is the principal source of history for the Trans-Elbian Slavic districts during the period it covers. The best edition of the *Chronicon* is by Kurtz in *Scriptores Rerum Germanicarum* (Hanover, 1889). It was translated by Laurent (Berlin, 1848, and Leipzig, 1892).

THIGH. The portion of the lower extremity which extends from the hip to the knee. The muscles of the front of the thigh are tensor fasciæ femoris, sartorius and quadriceps extensor, the last of which is a powerful group of four muscles (rectus, crureus, and the two vasti) which are inserted below into the patella, or knee-cap, and whose action is to strengthen the knee, thus being a most important factor in the preservation of the erect position and in locomotion. The muscles of the back of the thigh are biceps, semitendinosus and semimembranosus, also called the 'hamstring muscles.' Their action is to flex the leg on the thigh, to support the pelvis upon the head of the femur, or thigh bone, and to draw the trunk backward. On the inner side of each thigh is a group of adductor muscles, whose action is to bring the knees together. There is but one bone in the thigh, the femur, which articulates with the pelvis above and with the tibia below. The most important structures of the thigh lie in the triangle of Scarpa (q.v.). This is bounded above by Poupart's ligament, which is the base of the triangle, internally by adductor longus, and externally by sartorius. The great femoral artery and vein pass through the triangle dividing it into nearly equal parts, the artery giving off here the profunda femoris and the vein receiving the long saphenous. The anterior crural nerve lies to the outer side of the artery. Femoral hernia appears in Scarpa's triangle, and not infrequently the extremity of a fistula running from Potts' disease of the spine appears in this space.

THIGMOTROPISM (from Gk. *θιγμα*, *thigma*, anything touched + *τροπή*, *tropē*, a turning, from *τρέπειν*, *trepein*, to turn). The sensitiveness of organisms to stimuli by contact, especially to prolonged contact with solid substances. The responses in plants depend chiefly upon a modification of the growth of the organs concerned. It is especially marked in tendrils. Other examples are to be found in the similar curvatures of the petioles of leaf climbers, and in the stems of dodder. See Growth.

THIL'LY, Frank (1865—). An American educator, born in Cincinnati, Ohio. He graduated at the university of his native city in 1887, and then studied for two years at the University of Berlin, and for two more at Heidelberg. In 1892-93 he was an instructor of logic and the history of philosophy in the Sage School of Philosophy at Cornell University. In 1893 he was appointed professor of philosophy at the University of Missouri. His publications include: *Leibnitz's Controversy with Locke* (1891); *An Introduction to Ethics* (1900); and translations of Frederick Paulsen's *Einleitung in die Philosophie* (1895) and Weber's *History of Philosophy* (1896).

THIONVILLE, tē'ôɴ'vēl'. See Diedenhofen.

THIOSULPHURIC ACID (from Gk. *θεῖον*, *theion*, sulphur + Eng. *sulphuric*), $H_2S_2O_3$, less properly 'hyposulphurous acid.' An acid compound unknown in the isolated state and but little known in the form of dilute aqueous solutions, but well known in the form of its salts, called thiosulphates (or hyposulphites), especially its sodium salt. The thiosulphates are formed by the action of metals (such as zinc, iron, etc.) on acid sulphites. The thiosulphates of the alkalies are freely soluble in water; those of the alkaline earths are much less soluble; while those of the heavy metals are by themselves insoluble, but generally form soluble double compounds with the thiosulphates of the alkalies. The thiosulphate of sodium may be prepared in the laboratory by boiling a solution of sodium sulphite with sulphur. It may also be made from the thiosulphate of calcium. The latter is produced by the action of sulphur on lime. Hence it is produced (along with calcium pentasulphide) when lime is used for the purification of illuminating gas. Further, it is formed when a solution of calcium pentasulphide is exposed to the oxidizing action of the air—a reaction causing the production of the thiosulphate in the manufacture of soda (q.v.) and its increased production in the purification of illuminating gas. Aqueous sodium thiosulphate has the remarkable property of dissolving the halogen salts of silver, mercurous chloride (calomel) and iodide, the iodide and the sulphate of lead, the sulphate of calcium, and the oxides of copper. Owing to its capacity for dissolving the halogen salts of silver unaltered by light, it is extensively used in photography. It is further employed in the manufacture of certain coal-tar colors and in dyeing.

THIRD. See Interval.

THIRD ESTATE (Fr. *tiers état*). See States General; France; French Revolution.

THIRL'WALL, Newell Connop (1797-1875). An English historian and bishop. He was born in London. He studied at Charterhouse School and graduated at Trinity College, Cambridge, in 1818. In 1820 he entered Lincoln's Inn and was called to the bar in 1825, but the profession of the law was distasteful and he spent the intervening years until 1828 in travel and literary pursuits, publishing translations of tales from Tieck and Schleiermacher's *Critical Essay on the Gospel of St. Luke* (1825). In 1827 he took up his residence in Cambridge, and until 1834 he held various offices in the university, when he was called upon to resign his appointment as assistant tutor on account of a pamphlet, *Letter on the Admission of Dissenters to Academical Degrees.* He accepted a living at Kirby Underdale in Yorkshire, where he wrote his *History of Greece* (1835-44). In 1840 he was appointed bishop at Saint David's in Wales; in 1874 he resigned his see and retired to Bath, where he died. With J. C. Hare he translated *Niebuhr's History of Rome* (1828-32). His *Remains, Literary and Theological,* and *Essays, Speeches, and Sermons* were edited by J. J. S. Perowne (London, 1877-80); his *Letter to a Friend,* with a memorial sermon, was edited by Dean Stanley (ib., 1882), and his *Letters, Literary and Theological,* by Perowne and Stokes (ib., 1881).

THIRST (AS. *þurst*, *þyrst*, Goth. *þaúrstei*, OHG. *durst*, Ger. *Durst*, thirst; connected with Lat. *torrere*, to parch, Gk. *τέρσεσθαι*, *tersesthai*, to become dry, Skt. *tarṣ*, to thirst). A sensation normally due to a lack of water in the tissues of the body. Although the sensation of thirst is referred principally to the mouth and throat, it is not a purely local feeling and can be satisfied by the introduction of fluid into the circulation through various channels. Water may be absorbed and thirst relieved by transfusion of saline solution into the veins, by injection into the tissues (hypodermoclysis), and to a less extent by absorption from the skin, as well as by drinking. In a state of thirst, the body fluids become reduced in volume, and of higher specific gravity and more saline, and these conditions sufficiently explain the craving for water. Thirst is occasioned physiologically by profuse perspiration from exercise—especially in a warm, dry atmosphere—by a highly seasoned diet, or by salty food. Many morbid conditions give rise to thirst; it is always an accompaniment of fevers and inflammations; diseases which, like cholera asiatica, diabetes, and diarrhœa, are characterized by a great loss of fluid from the body, are productive of thirst. Loss of blood produces a great craving for liquids. As an exception to the rule that fevers demand drink, it may be noted that in typhoid fever thirst is sometimes blunted or suppressed. Thirst is most effectively relieved by slightly acidulated drinks, since these provoke an outflow of saliva. In fevers, cracked ice, effervescing drinks, and fruit juices are grateful and help to reduce the temperature.

THIRTY-NINE ARTICLES OF RELIGION, The. See Articles, The Thirty-Nine.

THIRTY TYRANTS. A body of rulers in Athens, invested with sovereign power after the close of the Peloponnesian War, B.C. 404. They were all native Athenians, but members of the aristocratic party, and chosen by the Spartan conquerors, who, knowing the animosity existing between the democracy and the oligarchy of Athens, hoped to rule the city through the agency of the latter. Their government was a reign of terror, marked by the most infamous cruelties. One of the most rabid and unscrupulous members of the body was Critias (q.v.), while Theramenes (q.v.) headed the more moderate division. The rule of the Thirty Tyrants lasted only one year, when it was overthrown by the return of the Athenian exiles under Thrasybulus (q.v.), and the surviving members were expelled from the city.

THIRTY TYRANTS. The collective title given to a set of military usurpers who sprang up in different parts of the Roman Empire during the fifteen years (A.D. 254-268) occupied by the reigns of Valerian and Gallienus, and, amid the wretched confusions of the time, endeavored to establish themselves as independent princes. The name is borrowed from the Thirty Tyrants at Athens, but, in reality, historians can only reckon nineteen—Cyriades, Macrianus, Balista, Odenathus, and Zenobia, in the East; Postumus, Lollianus, Victorinus (with his mother, Victoria), Marius, and Tetricus, in the West; Ingenuus, Regillianus (more properly Regalianus, as the name appears on coins), and Aureolus, in Illyricum and the countries about the Danube; Saturninus, in Pontus; Trebellianus, in Isauria; Piso, in Thessaly; Valens, in Achæa; Æmilianus, in Egypt; and Celsus, in Africa.

THIRTY YEARS' WAR. The name given to the great European struggle (1618-48) which marked the climax of the Reformation (q.v.), closing the period of distinctively religious politics and opening that in which secular statecraft took the place of ecclesiastical. The Religious Peace of Augsburg (1555) afforded no permanent settlement of the questions that had been stirred up by the Protestant revolution. Its terms recognized only Lutherans and Catholics, and meanwhile the Calvinists had grown strong, and, unfortunately for the Protestant cause, the most violent enmity existed between them and the Lutherans. The relations of the Emperor and the German princes were ill-defined and such adjustment as had been reached was hardly tenable. France had already separated her natural interests from the affiliations of religion and aided the German Protestant princes in their insubordination toward their Imperial Catholic head. The Reformation, by overthrowing the idea of Christ's unity in the Church, broke down the theory of a Holy Roman Empire and put forward in its place the Germanic idea of autonomy for individual States. In the turmoil of sixteenth-century Europe it was inevitable that the solvent for these and many collateral issues should be found in a general war. The outbreak came in an unexpected way. The liberal reign of Maximilian II. (1564-76) was favorable to the growth of Protestantism in the Austrian dominions. His successor, Rudolph II. (1576-1612), brought in the reactionary Jesuit influence and allowed full play to the forces of the Counter-Reformation. Open interference with the practice of the Protestant religion was permitted and numbers of Protestant churches were destroyed. In 1607 Maximilian I., the Catholic Duke of Bavaria, made himself master of the free Imperial city of Donauwörth, whose inhabitants were mainly Protestants. A number of Protestant princes and cities founded in 1608 the Evangelical Union for the defense of their interests and their faith, and this was met by the formation of the Catholic League under the leadership of Maximilian of Bavaria in 1609. In that year the Emperor was forced to publish his *Majestätsbrief*, by which the Protestants of Bohemia were guaranteed the free exercise of their religion. At this time the political state of the Empire was further unsettled by the Jülich-Cleves war of succession. (See JÜLICH.) In 1612 the Emperor Rudolph II. died and was succeeded by his brother Matthias, to whom the Archduchy of Austria, Moravia, Hungary, and Bohemia had previously been transferred as a result of Rudolph's reckless rule. In 1617 the Bohemian estates were called upon to crown, as their prospective King, Duke Ferdinand of Styria, the Hapsburg heir presumptive, in accordance with a custom which had become established. Ferdinand had made himself prominent by the relentless manner in which he had rooted out Protestantism in his paternal Styrian dominions. His attitude encouraged the Catholic Church in Bohemia in its aggressions, and soon a dispute regarding the interpretation of the *Majestätsbrief* brought on an open conflict. On May 23, 1618, a body of Protestants, led by Count Thurn, entered the royal palace at Prague, and hurled two odious representatives of the Crown, Martinitz and Slavata, from its windows. This 'defenestration,' the victims of which escaped with their lives, inaugurated a struggle which was to convulse Europe for thirty years.

The Bohemians rose in arms under Thurn, and the insurrection spread into the adjoining Hapsburg dominions. A body of troops of the Union, under Count Mansfeld, appeared on the scene, and Bethlen Gábor, Prince of Transylvania, prepared to make war on Austria. Matthias was wholly unprepared to meet the onslaught. Spain alone came to his aid, but the Spanish force was too weak to stay the advance of the enemy. The Emperor died in March, 1619, and Ferdinand, who succeeded him as the head of the House of Hapsburg, found himself beleaguered in Vienna by the victorious Thurn. Through his indomitable firmness he succeeded in averting the fall of his capital, and made his way to Frankfort, where he was elected Holy Roman Emperor as Ferdinand II. (August, 1619). The Bohemians, having declared their throne vacant, placed their crown upon the head of the Elector Palatine Frederick V., the son-in-law of James I. of England. Ferdinand, whose capital was in the meanwhile again threatened, this time by the Prince of Transylvania, was enabled to attack Frederick by means of the forces of the Catholic League, whose leader, Maximilian of Bavaria, was offered a rich indemnity. John George, the Lutheran Elector of Saxony, eager for territorial acquisitions, entered the field against the Bohemians, while the Spaniards invaded the Lower Palatinate. The Protestant Union dared not move, and James I. kept aloof from Frederick. On November 8, 1620, a battle was fought at the White Hill, before the walls of Prague, in which the army of the League, under Tilly, was completely victorious. Frederick fled from Bohemia, which was chastised in a fearful manner by the Emperor, and forced back into the fold of the Catholic Church. The dissolution of the Evangelical Union ensued. The cause of the Elector Palatine, however, whose hereditary dominions, the Upper and the Lower Palatinate, were assailed, found independent and intrepid champions in Mansfeld and Christian of Brunswick, lawless partisan leaders. George Frederick, the Margrave of Baden-Durlach, also took up arms for Frederick, and he and Mansfeld gained a victory over Tilly at Wiesloch on April 27, 1622. On May 6th, however, the former was vanquished by Tilly at Wimpfen, and on June 20th a like disaster befell Christian of Brunswick at Höchst. On August 6, 1623, Christian of Brunswick sustained a second defeat at the hands of Tilly at Stadtlohn. Frederick was stripped of his possessions. The Upper Palatinate and the electoral dignity were conferred on Maximilian of Bavaria.

The war might have ended with this local struggle, but the outrageous treatment to which the Protestant States of North Germany were subjected pressed the conflict on to its second phase. Christian IV. of Denmark, aided by a British subsidy, went to the aid of his German co-religionists in 1625, and being joined by Mansfeld and Christian of Brunswick, advanced into Lower Saxony, while the Emperor, hampered by the political jealousy of the Catholic League, was at first unable to oppose him. It was at this juncture that Wallenstein came forward and placed a great army, raised by himself, at the disposal of Ferdinand. This army acted in coöperation with that of the Catholic League under Tilly. Mansfeld was completely defeated by Wallenstein at Dessau (April 25, 1626), and the forces of Christian IV. were routed by Tilly at Lutter (August 27, 1626). Wallenstein marched as far as Hungary in pursuit of Mansfeld, who died in November, 1626. The combined Imperialists and Leaguers overran North Germany and Wallenstein penetrated into the heart of Denmark. The Imperialist commander conceived the design of making Austria a power on the Baltic, but his career in this direction was checked by the heroic defense of Stralsund (1628). King Christian was forced to conclude the humiliating peace of Lübeck (May 12, 1629). Inflamed by his success, Ferdinand had, on March 6, 1629, issued the Edict of Restitution, by which the Protestant titles to all ecclesiastical lands acquired after 1552 were declared void. Thus closed the second period of the war, with the Protestant States infuriated by the edict and the proud city of Magdeburg alone in arms to resist its execution.

Richelieu (q.v.), developing the anti-Hapsburg policy of Henry IV., had promoted, as far as the internal affairs of France would allow, the dissensions in Germany. He now succeeded in bringing into the struggle the able and ambitious Protestant King of Sweden, Gustavus Adolphus (q.v.). This ruler, desirous of promoting Protestantism and of securing the control of the Baltic, took the field, and the Swedish phase of the war began with the landing of the Swedes on the coast of Pomerania in the summer of 1630. Just at this time the princes of the Catholic League, exasperated by the overbearing conduct of Wallenstein and the excesses of his soldiery, forced the Emperor to dismiss him, Tilly being made commander-in-chief of the Catholic forces. Gustavus Adolphus, who in January, 1631, entered into a subsidiary alliance with France, advanced southward into Germany. The electors of Saxony and Brandenburg at first remained neutral, but finally were forced to join him. The obstacles in his path delayed him until it was too late to rescue Magdeburg, which on May 20, 1631, was stormed by Tilly and Pappenheim, whose troops burned the town and massacred the inhabitants. On September 17 (old style, September 7), 1631, the Swedish King, strengthened by the Saxon army under Arnim, overwhelmed Tilly at Breitenfeld, near Leipzig, a victory which completely restored the Protestant cause. He then victoriously traversed the Main and Rhine valleys; forced the passage of the Lech in front of the army of Tilly, who was mortally wounded (April 15, 1632); entered Munich, and threatened the Hapsburg dominions. Wallenstein, meanwhile, had been recalled to raise and command the Imperialist armies to meet this formidable enemy. He compelled the Swedes by skillful strategy, to return to Saxony. There the Swedes won the battle of Lützen (q.v.), November 16 (old style, November 6), 1632, after an obstinate engagement in which Gustavus was killed. His death was a severe blow to the Protestant cause, but the energy and ability of the Swedish Chancellor, Oxenstierna (q.v.), and the brilliant talents of the Swedish generals, preserved the advantages that had been gained. After the battle of Lützen Wallenstein remained long inactive, engaging in endless negotiations. Bernhard (q.v.) of Saxe-Weimar, one of the ablest of the Protestant leaders, overran Bavaria, and on November 14, 1633, stormed Ratisbon. The behavior of Wallenstein, after a display of activity, inaugurated by a victory over the Swedes at Steinau, October 13, 1633, finally left no doubt in the mind of Ferdinand II. that his general was meditating treason. He was deposed from his command and was assassinated at Eger in Bohemia, on February 25, 1634. His virtual successor, Gallas, inflicted a crushing defeat on Bernhard of Weimar and the Swedish general, Horn, at Nördlingen (September 6, 1634) which again restored to the Emperor a preponderating influence in Germany. Saxony now made peace at Prague (May 30, 1635), the Elector securing important territorial gains. Other Lutheran States withdrew from the conflict, the Calvinists being left to their fate.

Final success now appeared to demand only one more strenuous effort on the part of Austria; but Oxenstierna was determined to preserve to Sweden her German acquisitions, and Richelieu saw that the time had come for France to throw herself into an active struggle against both Austria and Spain. The conflict advanced into its final and most extended phase. At first the Hapsburg side was enabled to make a show of strength, France being invaded by a combined force of Spaniards, Imperialists, and Lotharingians, but with such commanders on their side as Bernhard of Weimar and the Swedish general Banér, the tide soon set in strongly in favor of the Protestants. The victory of Banér over the Imperialists and Saxons at Wittstock (October 4, 1636) restored to Sweden the advantage lost two years before. Bernhard of Weimar, in the pay of France, fought with energy and success, ambitious to found a State for himself. In 1638 he won a victory at Rheinfelden and succeeded in reducing the fortress of Breisach, but in the following year he met with an untimely death. In February, 1637, the Emperor Ferdinand II. died and was succeeded by his son, Ferdinand III. After the death of Banér, in 1641, the Swedish arms were led to fresh triumphs by Torstenson, a general famous for the rapidity of his movements. He defeated the Archduke Leopold William and Piccolomini at Breitenfeld on November 2, 1642; in 1644 he overran Denmark, whose ruler, Christian IV., had been induced to take up arms against Sweden; in the same year he defeated Gallas at Jüterbock; and on March 6, 1645, he won a great victory over the Imperialists, under Hatzfeld, at Jankau, in Southern Bohemia. His repeated invasions carried devastation and ruin into the territories, even to the gates of Vienna, until the Austrians hardly dared appear to the north of the Danube. In the meanwhile, in the west and south, the French were waging war with varying success. In January, 1642, they were successful at Kempen, near Düsseldorf, and in May, 1643, the Duke d'Enghien (the future Condé) won a signal victory over the Spaniards at Rocroi, but on November 24, 1643, the French-Weimar forces suffered a great defeat at Tuttlingen, in Swabia, at the hands of Johann von Werth and Mercy. Condé and Turenne restored the fortunes of the French by a victory at Allersheim, near Nördlingen, August 3, 1645. The Emperor was now deserted by all his allies except the Duke of Bavaria, whose territories were already mostly in the hands of Turenne and the Swedish general Wrangel; and a combined invasion of Austria from the west and north was on the point of being executed, when the diplomatic representatives of the different governments, who had been at work for seven years at Münster, in Westphalia, and at Osnabrück, agreed upon terms of peace which closed the struggle. See WESTPHALIA, PEACE OF.

Aside from the political disintegration of Germany which resulted from the war, the thirty years' struggle had brought desolation upon the country. Scarcely any part of the Empire had escaped the horrors of the conflict, and the people had been made the victims of an unbridled and licentious soldiery whose excesses have remained in popular memory to the present day. Whole regions were laid waste, prosperous towns were wiped out, commerce and industry were destroyed. Germany lost half of her population and two-thirds of her wealth, while in some regions the decrease in population rose to two-thirds, as in Bohemia, or even higher. Religion and morality sank to a low ebb, and the loss entailed on the intellectual side was one which it took generations to make good.

Consult: Gardiner, *The Thirty Years' War* (London, 1874), a convenient and reliable brief account; Gindely, *Geschichte des dreissigjährigen Kriegs* (Prague, 1869-80), trans. by Ten Brook (New York, 1884), by a recognized authority, a Bohemian, who made this his life study. Consult also references under GUSTAVUS ADOLPHUS; RICHELIEU; WALLENSTEIN, etc.

THISBE. See PYRAMUS AND THISBE.

THISTLE (AS. *þistel*, OHG. *distula, distil*, Ger. *Distel*, thistle). A popular name for various plants of the natural order Compositæ. They have either stout, spiny herbage or flowering bracts. They are widely distributed, mostly as weeds. In the United States the name applies to the species of Cnicus, Carduus, Onopordon, Centaurea, and Sonchus. By some botanists the first two genera are combined under the name Carduus. The principal distinction between these two is that Cnicus has plumose pappus and hence is often called plume thistle, while Carduus has bristly pappus. The species belonging to the other genera are all introduced from the Old World. The pasture thistle (*Cnicus pumilus*), yellow thistle (*Carduus horridulus*), bull thistle (*Carduus lanceolatus*), and others are common and troublesome in pastures and on roadsides. *Carduus arvensis*, the so-called Canada thistle, a European species, is one of the most troublesome and difficult to eradicate of all. It is a slender perennial, one to three feet high, with rather small, rose-colored flowers. It spreads principally by its spreading rootstocks, but can be eradicated by persistent cultivation. The heads are imperfectly diœcious and not all produce seed. Among the other common European thistles found in the United States is the milk thistle (*Silybum Marianum*), a biennial plant four to six feet tall. The leaves are sometimes used as salads, or as pot herbs. The roots, for which it was formerly cultivated, were used like salsify. The blessed thistle (*Carbenia benedicta*), native of Asia, was formerly considered to have medicinal properties. It resembles the star thistle (Centaurea), of which there are many species, the best-known of which are *Centaurea Calcitrapa* and *Centaurea Cyanus*, the blue-bottle thistle. The cotton or Scotch thistle (*Onopordon Acanthium*) is recognized by its deeply honeycombed receptacle and cottony or woolly leaves. It is said to be the emblem of Scotland, but *Cnicus acaulis*, a stemless thistle common in Scotland, seems more worthy this designation. The Carline thistle (*Carlina vulgaris*) is a rather troublesome weed in poor soils in Europe, and was named Carline thistle because Charlemagne, according to tradition, used its roots as a cure for the plague. Species of Sonchus are called sow thistle, of which three are found in the United States, *Sonchus oleraceus*, the common sow thistle, *Sonchus asper*, the spiny leaved sow thistle, and *Sonchus arvensis*, the field sow thistle. Other plants of different orders are sometimes called thistles, as species of Dipsacus (see TEASEL) and blue thistle (*Echium vulgare*), the latter belonging to the order Boraginaceæ. See Plate of TANSY, ETC.

CANADA THISTLE (*Carduus arvensis*).

THISTLE. A steel yacht built in 1887 at Glasgow. She lost the contest for the America's cup to the *Volunteer*, and afterwards became the property of the German Emperor under the name of *Meteor*.

THISTLE, Order of the; less commonly Order of Saint Andrew. A Scottish order having the year 787 as the mythical date of its foundation. It was established by James V. in 1540, reorganized by James II. of Great Britain in 1687, and a second time reconstituted by Queen Anne in 1703. The statute of 1827 limits the number of knights to sixteen members of the Scottish nobility, in addition to the sovereign and princes of the blood. The star of the order is of silver with a round gold plaque bearing a thistle on a green field. The ribbon is green. The motto runs, *Nemo me impune lacessit.*

THISTLE-BIRD. The American goldfinch (q.v.).

THISTLEWOOD CONSPIRACY, or Cato Street Conspiracy. A plot against the British Government formed in 1819-20 by Arthur Thistlewood (1770-1820). It was planned to murder the Ministers at a dinner given by Lord Harrowby on February 23, 1820, to seize the Mansion House, attack the Bank of England, and to set fire to London in several quarters. All of Thistlewood's intentions were, however, regularly reported to the authorities by one of his confidants, George Edwards. On February 21, 1820, the conspirators hired a loft in Cato Street, and there they were arrested on February 23d. Thistlewood escaped, but was captured the following day. He was found guilty on April 19th, and hanged with four other conspirators on May 1st.

THO'AS (Lat., from Gk. Θόας). (1) The son of Dionysus and Ariadne. He was King of Lemnos and father of Hypsipyle (q.v.), who saved him when the men of the island were killed by the Lemnian women. (2) A King of Tauris. Artemis carried Iphigenia into his dominion after saving her from the sacrifice.

THO'BURN, James Mills (1836—). A Methodist Episcopal bishop. He was born at Saint Clairsville, Ohio; graduated at Allegheny College, 1857; was admitted to the Pittsburg Conference 1858; went to India as a missionary, 1859; was presiding elder of the Calcutta district (Bengal Conference), 1873-88; editor of *The Witness* for six years; represented the India Conference in the General Conference, 1876, the South India Conference, 1880, and the Bengal Conference, 1888. He was elected missionary bishop of India and Malaysia, 1888. He has written *My Missionary Apprenticeship* (1887); *Missionary Addresses Before Theological Schools* (1887); *India and Malaysia* (1893); *The Deaconess and Her Vocation* (1893); *Christless Nations: Addresses Delivered at Syracuse University on the Graves Foundation* (1895); *Light in the East* (1898); *The Church of Pentecost* (1901).

THOLEN, tō'len. An island belonging to the Province of Zealand, Netherlands, 22 miles north by west of Antwerp (Map: Netherlands, C 3). It covers an area of about 47 square miles. The little town of Tholen is in the eastern part. Population, in 1899, 3076.

THOLUCK, tō'lụk, Friedrich August Gottreu (1799-1877). A German theologian, born in Breslau. He became professor extraordinary of theology at Berlin in 1823, and full professor at Halle in 1826, where he spent the remainder of his life with the exception of a sojourn in Rome in 1828-29. Tholuck was an influential preacher, writer, and teacher. His most important work was exegetical. His commentaries on the Psalms, the Sermon on the Mount, John, Romans, Hebrews, have all been translated into English. His best known works are *Die wahre Weihe des Zweiflers* (1823; 9th ed. 1870; Eng. trans., *Guido and Julius*, 1854); *Das Alte Testament im Neuen* (1836; 7th ed. 1877); and *Stunden christlicher Andacht* (1840; Eng. trans., *House of Christian Devotion*, New York, 1875). Among his other works may be mentioned: *Lebenszeugen der lutherischen Kirche vor und während der Zeit des dreissigjährigen Krieges* (1859); *Geschichte des Rationalismus* (1st part, 1865). Consult his *Life* by L. Witte (Bielefeld, 1884-86). His collected works were published at Gotha (11 vols., 1863-72).

THOM, John Hamilton (1808-94). A Unitarian clergyman and author, born at Newry, in County Down, Ireland, where his father was settled as a Presbyterian minister. He studied at the Belfast Academical Institution with a view to the Presbyterian ministry, but he was won over to Unitarianism by the writings of William Ellery Channing (q.v.). From 1831 to 1866 he was minister of Renshaw Street Chapel, Liverpool. In this long pastorate there was, however, one break—from 1854 to 1857—when his place was taken by William Henry Channing (q.v.). Meanwhile (1838) he became editor of the *Christian Teacher* (afterwards the *Prospective Review*). In company with Martineau he conducted a famous controversy with Anglican divines on the interpretation of the New Testament (1839). Besides a life of Joseph Blanco White, Thom published mainly *Saint Paul's Epistles to the Corinthians* (1861); *Letters, Embracing His Life, by John James Tayler* (1872); *Laws of Life After the Mind of Christ* (1883). After his death appeared *A Spiritual Faith* (1895).

THOMA, tō'mȧ, Hans (1839—). A German painter, illustrator, and lithographer. With Feuerbach, Marées, and Böcklin, he became one of the leaders of modern painting in Germany. He was born at Bernau, in the Black Forest. In 1859 he studied at the Karlsruhe Academy with Schirmer, at Düsseldorf (1867), and then in Paris, where he came under the influence of Courbet. Afterwards he spent four years in Munich with Victor Müller, who also exerted a powerful influence upon him. But his style was eventually formed by study of the fifteenth-century Italians. In 1899 he took charge of the academy and gallery at Karlsruhe. His archaic figure drawing at first blinded the public to the richness of his color, the power and poetry of his imagination, and the depth of his sympathy with German life, but after the Collective Exhibition of German art at Munich in 1890 his true value began to be appreciated. Landscapes, portraits, genre scenes of German life, religious, mythological, and allegorical subjects, have been treated by him, and he has also done some work in lithography, etching, and illustration. His lithographs are full of decorative value. His paintings include: "The Keepers of the Garden of Love" (Breslau); "A Landscape with Children" and a portrait of himself (Dresden); "An Open Valley" (Frankfort); and "A Taunus Landscape" (Munich). Consult Thode, *Hans Thoma* (Vienna, 1891).

THOMAS, tŏm′*as* (Lat., from Gk. Θωμᾶς, from Heb. *Thōmā*, twin). One of the Twelve Apostles. In each of the Synoptic Gospels and the Acts Thomas is mentioned only in the lists of the twelve disciples (Mark iii. 18; Matt. x. 3; Luke vi. 15; Acts i. 13). In the fourth Gospel he appears as one who was inclined to overestimate difficulties and to be troubled with doubts (John xi. 16; xiv. 5; xx. 24-29). Though nothing more is said of him in the New Testament, he figures prominently in the traditions concerning the spread of Christianity in the Far East. The Syrian Abgar legend relâtes that Thaddæus, the Apostle of Eastern Syria, was sent thither by the Apostle Judas Thomas. This double name probably has some connection with the fact (see John xxi. 2) that Thomas's Greek name was Didymus, i.e. twin. Who his twin was is unknown. Some have suggested that it was James, the 'Lord's brother,' and that Thomas's real name was Jude or Judas. A tradition older than Eusebius gave Parthia as the mission field of the Apostle Thomas, while another, embodied in the Gnostic Acts of Thomas, made him the Apostle of India and related wonderful stories concerning him. To him the 'Thomas Christians' of Southern India assign their origin. Mount Saint Thomas, near Madras, is the place of his reputed martyrdom. As these Christians were closely connected with East-Syrian Christianity, it is probable that the basis of the whole fabric of tradition is some actual missionary labor of the Apostle Thomas in Eastern Syria. See Christians of Saint Thomas; Apocrypha.

THOMAS the Rhymer, or more correctly Thomas of Erceldoune (c.1220-c.1297). A Scottish seer and poet, about whom very little is positively known. Erceldoune (now called Earlston) was a village in Berwickshire on the river Leader, about two miles above its junction with the Tweed. The earliest extant mention of Thomas as a seer is in the continuation of Fordun's *Scotichronicon*, attributed to Walter Bower (d. 1449). For centuries all sorts of prophecies were connected with his name. A collection of them was published at Edinburgh in 1603 under the title *The Whole Prophesie of Scotland*. To Thomas the Rhymer has been attributed a beautiful fairy story in verse. According to the legend, Thomas was wont to meet a 'lady fair' on Huntly Banks near Eildon Tree. By her he was conveyed to fairyland, where he acquired the knowledge that made him famed. After living there for a period, he was permitted to go to the earth to practice his prophetic skill, on the condition that he should come back at the fairy's bidding. One day, while he was making merry with his friends, the summons came. He instantly arose, and disappeared in the forest never to be seen again on earth. Huntly Bank and the neighboring lands became a part of Abbotsford. The poem, consisting of the minstrel's usual prologue and three fyttes, contains 700 lines. It exists in four complete manuscripts, of which the oldest is the *Thornton* at Cambridge (assigned to 1430-40). Though they are all in English, they point to an older original, which may have been the composition of Thomas. Sir Walter Scott and others also ascribed to Thomas the verse romance of *Sir Tristrem*. It exists in a single manuscript in the Advocates' Library at Edinburgh. It seems to have been copied from a northern original by a southern scribe about 1450. Though the poem contains allusions to Thomas of Erceldoune, his authorship is now questioned. Consult: *The Romance and Prophecies of Thomas of Erceldoune*, ed. by J. A. H. Murray for the "Early English Text Society" (London, 1875); *Thomas of Erceldoune*, ed. by Brandl (Berlin, 1880).

THOMAS, Christians of Saint. See Christians of Saint Thomas.

THOMAS, Gospel of. See Apocrypha, section on *New Testament*.

THOMAS, tô′mä′, Ambroise (1811-96). A distinguished French operatic composer, born in Metz. In 1828 he entered the Paris Conservatory, studied under Zimmermann and Kalkbrenner (piano), and under Dourlen, Barbereau, and Le Suer in counterpoint, harmony, and composition. He won the Grand Prix de Rome in 1832. He succeeded Auber as director of the Conservatory in 1871. He was one of the most noted composers of the modern French school, and ranked second only to Gounod, whom he resembled in style. His chief success lay in opéra comique, the best example of which was *Mignon* (1866). His compositions include: *Le panier fleuri* (1839); *Le Caïd* (1849); *Le songe d'une nuit d'été* (1850); *Psyché* (1857); *Hamlet* (1868); *Françoise de Rimini* (1882); ballets; cantatas; requiems; chamber-music; and choruses for male voices, which are much esteemed.

THOMAS, Arthur Goring (1850-92). An English composer, born in Eastbourne, Sussex. He received his musical education in Paris, and later at the Royal Academy of Music, London, where he won the Lucas prize of 1879. He took up his residence in London, and devoted himself entirely to composition. His works include a grand anthem for soprano solo, chorus, and orchestra (1878); a cantata, *The Sun Worshipers* (Norwich Musical Festival, 1881); operas: *Esmeralda* (1883), *Nadeshda* (1885), and *The Golden Web* (1893, produced after his death); *Suite de ballet*, an orchestral suite (1887); and many popular songs, of which perhaps the best-known are from the *Swan and the Skylark* cantata, written just before his death in London.

THOMAS, Calvin (1854—). An American educator, born near Lapeer, Mich. He graduated at the University of Michigan in 1874, and studied philology for a time at the University of Leipzig. In 1878 he became instructor in German at his alma mater, where in 1881 he was made assistant professor and in 1886 professor of Germanic languages and literature. In 1896 he accepted the same chair at Columbia University. His publications include *A Practical German Grammar* (1895) and *Goethe and the Conduct of Life* (1886). In addition he edited, among other German works, Goethe's *Faust* (first part, 1892; second part, 1897); *Hermann und Dorothea* (1891); and *Torquato Tasso* (1888).

THOMAS, David (1813-94). An English Congregational minister. He was born at Vatson, near Tenby, Wales; was educated at Newport-Pagnell College; and from 1844 to 1877 was minister of the Independent Church at Stockwell, London. The remainder of his life was spent in retirement. He was greatly admired as a preacher, and had a large circle of readers for his monthly, *The Homilist, or Voice for the Truth* (1852-82), and for his collection of writings called *The Homilist Library* (1882-89). He compiled a liturgy for evangelical churches (1856), and a hymn-book (1866), which contained some fair hymns of his own composition.

THOMAS, EDITH MATILDA (1854-1925). An American writer. She was born in Chatham, Ohio, and was educated at the normal school of Geneva, Ohio. She began writing early for the local newspapers, and was encouraged by Mrs. Helen Hunt Jackson in 1881 to send verse to more important periodicals. She afterwards contributed to the *Independent*, *Century*, and *Atlantic Monthly*. Her first volume appeared in 1885, entitled *A New Year's Masque and Other Poems*. Other books are: *The Round Year* (1886), prose; *Lyrics and Sonnets* (1887); *Babes of the Year* (1888), prose; *Babes of the Nation* (1889), prose; *Heaven and Earth* (1889), also prose; *The Inverted Torch* (1890); *Fair Shadow Land* (1893); *In Sunshine Land* (1894); *In the Young World* (1895); and *A Winter Swallow, and Other Verse* (1896).

THOMAS, GEORGE HENRY (1816-70). A distinguished American soldier, born in Southampton County, Va. He graduated at West Point in 1840; served in the Mexican War, and distinguished himself at Monterey and Buena Vista. After the close of the Mexican War he served a year in Florida, three years as cavalry and artillery instructor at West Point, and then for five years in Texas as major in the Second Cavalry. On the outbreak of the Civil War, though he was by birth and associations a Southerner, he adhered to the Union cause; was lieutenant-colonel, and afterwards colonel of the Second Cavalry; commanded a brigade in the first Shenandoah campaign; and on January 19, 1862, he won the battle of Mill Springs, Ky. He was in command of the right wing of the Army of the Tennessee during the siege of Corinth, where he was in full command during a great part of June, 1862. He then commanded the centre of the Army of the Cumberland, and although appointed to supersede Buell as commander of the whole army, asked to be allowed to remain in a subordinate position. He rendered conspicuous service at Perryville and Stone River (q.v.), and commanded the Fourteenth Army Corps in the campaign of middle Tennessee in the summer of 1863. At the Battle of Chickamauga (q.v.), September 19-20, 1863, Thomas stood firm, and resisted the concentrated attack of a victorious enemy, gaining justly the title of 'the rock of Chickamauga.' Soon after he reluctantly succeeded to the post held by Rosecrans, and commanded the Army of the Cumberland at Missionary Ridge, and in the campaign of 1864 up to the capture of Atlanta. When Sherman marched thence to the sea, Thomas was sent into Tennessee, where, in the battle of Nashville, December 15 and 16, 1864, he crushed the army of Hood. He was at once appointed a major-general in the Regular Army, and Congress tendered him a vote of thanks. In 1865-66 General Thomas commanded the Military Division of the Tennessee, including Kentucky, Tennessee, Georgia, Alabama, and Mississippi, and the Department of the Tennessee, including the same States, the following year. From June, 1869, until his death, he was in command of the Military Division of the Pacific, with headquarters at San Francisco. His *Life* was written by Van Horne (New York, 1882).

THOMAS, GEORGE HOUSMAN (1824-68). An English painter and illustrator. He was born in London, where he was a pupil of Bonner. For a time he lived in the United States, and did some work as an illustrator and in designing bank notes. He represented the *Illustrated London News* during the Crimean War (1855-56), and upon his return to England he enjoyed the patronage of the royal family. The best-known of his illustrations are to be found in *Uncle Tom's Cabin* and in Wilkie Collins's *Armadale*.

THOMAS, ISAIAH (1749-1831). An American printer, born in Boston, Mass. He began business as a printer at Newburyport in 1767, and in 1770, in partnership with his former employer, established the *Massachusetts Spy*, becoming the sole editor at the end of three months, and conducting the paper first at Boston and then (after 1774) at Worcester until 1801. His paper soon became the organ of the Whig or Patriot Party, and fearlessly attacked the measures of the British Ministry. At Worcester and later at Walpole, N. H., he engaged in book publishing, issuing a number of reprints of standard English works, besides Bibles, hymn-books, and most of the school books then in general use, and publishing a magazine called *The Farmers' Museum*. In 1788 he opened a bookstore and publishing house in Boston, and from 1789 to 1796 published *The Massachusetts Magazine*. He issued the *New England Almanac* from 1775 to 1801, wrote an excellent *History of Printing in America* (1810), and founded (1812) the American Antiquarian Society, to which he gave a large library and a liberal endowment. Consult the *Memoir* prepared by Benjamin F. Thomas, his grandson (Boston, 1874).

THOMAS, JOHN (1725-76). An American soldier, born at Marshfield, Mass. He studied medicine, and became eminent as a physician. In 1746 he served as surgeon in a regiment sent to Nova Scotia, and in 1747 acted first as surgeon and then as lieutenant under Shirley. In 1759 he became a colonel of provincials, and in 1760 led a regiment at Crown Point and was at the capture of Montreal. He was appointed a brigadier-general in June, 1775, and a major-general in the following March. During the siege of Boston he was stationed on the Roxbury side, and on the night of March 4, 1776, with 3000 men, occupied Dorchester Heights, thus rendering Boston untenable for the British, who evacuated it on the 17th. He then was appointed to succeed Montgomery in Canada, and took command before Quebec on May 1st; but, finding the army small in numbers and weakened by disease, he ordered a retreat. Contracting the smallpox, he died near Montreal on May 30th.

THOMAS, JOHN (1826—). A Welsh harpist, born at Bridgend, Glamorganshire. He early showed remarkable musical talents; was a skillful piccoloist at the age of six years, and at eleven years of age competed as a harpist at the Abergavenny Eisteddfod for one of four triple harps which were offered as prizes. He was the youngest competitor, but was declared the winner of the best harp. He found a patron and friend in Ada, Countess of Lovelace, Byron's only daughter, who made it possible for him in 1840 to enter the Royal Academy of Music, where he remained for nearly six years. During his student days he wrote a harp concerto in B flat with orchestral accompaniment; a symphony; several overtures; quartets; and two operas, all of which were included in the programmes of the Academy concerts. In 1851 he became a member of Her Majesty's Opera House orchestra under Balfe, and in the autumn of the same year began the annual Continental tours which made him famous the world over. In 1862 he published his celebrated collection of Welsh melodies. In 1863 was produced at the Swansea Eisteddfod his dramatic cantata "Llewellyn," which was repeated in 1893 at the World's Fair, Chicago. In 1871 he was appointed harpist to Queen Victoria, and in the same year founded in London the Welsh Choral Union. He was also professor of the harp at the Royal College of Music, and at the Guildhall School of Music.

THOMAS, John Jacob (1810-95). A noted American horticulturist and writer. He was born on the shores of Lake Cayuga, in western New York State, and there spent his life on a farm. For nearly sixty years he exercised a wide influence as an editorial writer for *The Cultivator* and *The Country Gentleman*, his articles dealing with a great variety of practical farm topics. He also published a book, *Farm Implements and Machinery*, and a nine-volume work, *Rural Affairs*, both of which were valuable in their day and serve as records of their time. His fame rests chiefly upon his work as a pomologist and upon his book, *The American Fruit Culturist*, which appeared first in 1846. As revised by W. H. S. Wood in 1897 it reached its twentieth edition.

THOMAS, Joseph (1811-91). An American lexicographer and physician. He was born in Cayuga County, N. Y.; educated at the Polytechnic Institute, Troy, and at Yale College, and then studied medicine in Philadelphia. In 1857-58 in India, and afterwards in Egypt, he made a special study of the Oriental languages and subsequently became professor of Latin and Greek at Haverford College, Pa. In association with Thomas Baldwin he published in 1845 *A Pronouncing Gazetteer*, in 1854 *A New and Complete Gazetteer of the United States*, and in 1855 *The Complete Pronouncing Gazetteer of the World*, which has been repeatedly revised. In 1870-71 appeared his *Universal Pronouncing Dictionary of Biography and Mythology*, a monument of scholarly and painstaking labor. *Webster's Unabridged Dictionary* is supplied with his 'pronouncing vocabulary' of proper names, in which department his work had high authority. Thomas also edited *A Comprehensive Medical Dictionary* (1864; revised 1886).

THOMAS, Lorenzo (1804-75). An American soldier, born in Newcastle, Del. He graduated at the United States Military Academy in 1823, and served in the Florida War. In 1838 he was appointed assistant adjutant-general, in 1839-40 was chief of staff of the forces in Florida, served in the Mexican War as chief of staff of Gen. W. O. Butler, and was brevetted lieutenant-colonel for gallantry at Monterey. From 1861 to 1863 he was adjutant-general with rank of brigadier-general, and during the remaining two years of the war organized colored troops in the Southern States. President Johnson in 1868 appointed him Secretary of War *ad interim*, but as E. M. Stanton refused to vacate his post, he did not assume office. In 1865 he was brevetted major-general, and in 1869 was retired.

THOMAS, M. Carey (1857—). An American educator, born at Baltimore, Md. She was educated at Cornell University, where she graduated in 1877, and at Johns Hopkins University, and the universities of Leipzig and Zurich. She took the degree of doctor of philosophy from the last-named institution in 1883, being the first woman to receive the doctorate of arts at a European university. In 1885 she became professor of English and dean, and in 1894 president of Bryn Mawr College. In 1895 she was elected trustee of Cornell University, and in 1896 she received the degree of LL.D. from the Western University of Pennsylvania. She published in 1883 a study of Sir Gawayne and the Green Knight, and after that time various educational addresses.

THOMAS, Seth (1785-1859). An American manufacturer, born in Wolcott, Conn. After receiving a meagre education, he was apprenticed to a carpenter and joiner in New Haven. Subsequently he settled in Plymouth Hollow (now Thomaston) and with two partners began the manufacture of clocks, finally becoming sole proprietor of an establishment which grew to be one of the largest clock factories in the world.

THOMAS, Sidney Gilchrist (1850-1885). A British metallurgist and inventor. He was born in London and received an elementary education at Dulwich College, but by study after hours spent in a clerkship was able to gain a thorough knowledge of chemistry, especially in its relations to technology. When opportunity offered he attended lectures at the Royal School of Mines and was able to pass the examinations for the degree in metallurgy, which was, however, denied him, owing to lack of attendance on day lectures. From 1870 his attention was directed to the elimination of phosphorus in the Bessemer converter, and in 1875 he reached a practical solution of the problem by employing a 'basic' lining of magnesia or magnesian limestone. He secured the coöperation of his cousin Percy Gilchrist, also a chemist, and after obtaining a first patent in November, 1877, announced the invention in the following year. The process, which is discussed under Iron and Steel, soon came into wide use all over the world, and Thomas received both financial returns and scientific honors. notable among which was the Bessemer medal of the Iron and Steel Institute of Great Britain in 1883.

THOMAS, Theodore (1835-1905). A distinguished German-American orchestral conductor, born in Esens, East Friesland. He received his musical education from his father, and played the violin at public concerts when only six years of age. He came with his parents to America in 1845, and was a member of the orchestra of the Italian opera in New York. He played first violin in the first American concert tour of Jenny Lind. In 1861 he began the formation of his famous orchestra, and in 1864 gave his first symphony concerts in New York. In 1866 he instituted his summer-night festivals. In 1869 he conceived the idea of traveling during the time unoccupied in New York, and for nine years he made an annual round of the principal American cities. In 1878 he accepted the position of director of the College of Music at Cincinnati, but in the spring of 1880 he resigned his position to return to New York. From 1878 to 1890 he was the conductor of the Brooklyn Philharmonic Society, and in 1890 he went to Chicago. The orchestra which he built up in Chicago became one of the recognized great orchestras of the world, and, notwithstanding the heavy annual deficit which was a feature of many of the years of its existence, its guarantors supported Thomas in his unswerving determination to present nothing but the best in music. He refused to cater to the popular taste, and finally succeeded in winning the public to his own ideals. See CHICAGO ORCHESTRA.

THOMAS, THEODORE GAILLARD (1832-1903). An eminent American gynæcologist, born in Edisto Island, S. C., and educated in Charleston. He studied in Europe, principally in Paris and Dublin, in 1853-55, and began the practice of his profession in New York. He was lecturer in the New York University (1855-63), and professor in the College of Physicians and Surgeons, New York City (1863-89), in which he was professor of gynæcology when he retired. He was a finished speaker, a man of great personal charm, a clear thinker, an expert analyst, and an exact and skillful surgeon. Dr. Thomas wrote *Diseases of Women* (Philadelphia, 1868), which passed through six editions in English, and was translated into French, German, Spanish, Chinese, and Italian. See his biography in *Medical Record*, vol. lxiii. (New York, 1903).

THOMAS à BECKET, à bĕk'ĕt. See BECKET.

THOMAS à KEM'PIS. See KEMPIS.

THOMAS AQUINAS. See AQUINAS.

THOMASIUS, tô-mä'zê-ụs, CHRISTIAN (1655-1728). A German philosopher and jurist, born in Leipzig. He began to lecture in the University of Leipzig. His lectures were free from the pedantry of the schools, and were delivered in the German language instead of the traditional Latin. These innovations brought upon him the hostility of the conservative educators. He also edited the first scientific journal in the German language, but the liberal tone of it excited so much opposition that he was forced to leave Leipzig. He went to Halle in 1690, where he was one of the founders of the university and its first professor of jurisprudence. The great aim of Thomasius was to harmonize and blend science and life. His important works were: *Institutionum Jurisprudentiæ Divinæ Libri Tres* (1688); *Fundamenta Juris Naturæ et Gentium* (1705); and *Geschichte der Weisheit und Thorheit.* For his life, consult Luden (Berlin, 1805), Wagner (ib., 1872), and Klemperer (ib., 1888).

THOMASIUS, GOTTFRIED (1802-75). A German theologian. He was born at Egenhausen, Württemberg, studied at Erlangen, Halle, and Berlin, and was professor of systematic theology at Erlangen from 1842 till his death. His most important publications were: *Origines* (1837); *Christi Person und Werk* (1852-61; 3d ed. 1886-88); *Die christliche Dogmengeschichte* (1874-76; 2d ed. 1886-89).

THOMAS (*Lat. pron.* thō'mās) **MAGIS'TER** (Gk., *Θωμᾶς ὁ μάγιστρος*, *Thōmas ho magistros*, Master Thomas). A Greek rhetorician and grammarian of the early part of the fourteenth century. He was probably born at Thessalonica, and lived some time at the Court of the Byzantine Emperor Andronicus Palæologus II., where he held important offices. Later he retired to a monastery, and devoted himself to the study of the Greek language. His principal work is a Lexicon of Attic Greek (*'Εκλογαὶ ὀνομάτων 'Αττικῶν*), compiled from other grammarians. The work possesses some value, as it has preserved writings which would otherwise have been lost. Aside from the lexicon, the works of Thomas Magister include scholia to Æschylus, Sophocles, Euripides, and three plays of Aristophanes, which are preserved with the other scholia to those authors, as well as lives of these writers which have come down to us in the manuscripts of their works. Letters and orations of Thomas Magister have been preserved. Especially noteworthy is the oration on Gregory of Nazianzus. The earliest edition of the Lexicon is that of Z. Callierges (1517); the latest, that of Ritschl (1832).

THOMAS OF CELANO, châ-lä'nô (c.1200-?). One of the first members of the Franciscan Order. He was born at Celano, in the Abruzzi, became acquainted with Francis of Assisi, and was in 1221 sent by him upon a mission to Germany. In 1223 he was placed over the monasteries of Worms, Speyer, Mainz, and Cologne, but in 1230 we find him again in Italy. His intimacy with Francis eminently fitted him to be his biographer, and he wrote two sketches of the saint, which are of primary importance, as well as the *Life* of Saint Clara. Of more universal interest is his claim, now practically admitted by all scholars, to be considered the author of the *Dies Iræ* (q.v.), except perhaps the last six verses. The date of his death is unknown.

THOMAS SLAG, PHOSPHATIC SLAG, BASIC SLAG, ODORLESS PHOSPHATE, or THOMAS PHOSPHATE POWDER. A by-product of the manufacture of steel from phosphatic ores by the basic or Thomas process, in which phosphorus is eliminated from the pig iron by means of basic (rich in lime) lining to the Bessemer converters and by adding lime to the molten pig iron. The slag is therefore rich in lime (about 15 per cent. in the free state and 40 per cent. combined with other substances). The phosphoric acid content of the product as found in the market is very variable, ranging from 10 to 25 per cent. Slag of average quality contains 15 to 20 per cent. of phosphoric acid. In good slag 80 per cent. of this phosphoric acid should be available, as shown by the chemical methods of determining availability, i.e. by treatment with a solution of citric acid or ammonium citrate. The phosphoric acid of slag, unlike that of superphosphates, is practically insoluble in water. Recently attempts have been made with some success to prepare a slag in which the phosphoric acid is more available by fusing the product as obtained from the converters at about 900° C. with sufficient silica (quartz) to convert the free lime into silicate. Such slag differs materially from the untreated product not only in containing a higher percentage of available phosphoric acid and of silica, but in being practically devoid of free lime. Basic slag is not suited to the manufacture of superphosphates and is generally used without any treatment except fine grinding. Purchasers of Thomas slag should insist on its being finely ground, as the value of the material depends very largely upon its fineness.

Slag has been used in large quantities for agricultural purposes in Europe for a number of years—in 1899 1,655,000 tons. Of this 895,000 tons were used in Germany and 170,000 in France. In 1885 the use of this material was practically confined to Germany and amounted to only 5000 tons. Since the total consumption of phosphatic fertilizers in Germany in 1899 was 1,864,000 tons, and in France 245,000 tons, nearly half of the phosphatic fertilizers used in these countries was Thomas slag. Slag has not been extensively introduced into the United States. Some has been manufactured at Pottstown, Pa., and put on the market under the name of 'odorless phosphate.' Experiments have shown slag to be a very valuable phosphatic fertilizer, and on account of its high percentage of lime especially suited to use on acid soils and those rich in organic matter. It would not be wise to use it freely on poor sandy soils deficient in organic matter. Experiments have indicated that slag and dissolved boneblack are about equally effective, taking into account the after-effects of the slag, while the cost of the latter is nearly twice that of the former.

Slag appears to be especially suited to leguminous crops. Six hundred to one thousand pounds per acre is considered a liberal dressing. It should not be mixed with ammonium sulphate before use, since its high percentage of free lime is likely to cause a loss of ammonia by volatilization. Mixtures of the slag with other salts, such as muriate of potash and nitrate of soda, cake badly and are difficult to handle and distribute uniformly. See MANURES AND MANURING.

THOMASVILLE, tŏm'as-vĭl. A city and the county-seat of Thomas County, Ga., 200 miles southwest of Savannah; on the Atlantic Coast Line, and other railroads (Map: Georgia, B 5). It is picturesquely situated on high ground, and has gained considerable prominence as a winter and health resort. There are two large hotels. The South Georgia College is here, and the city maintains a public library. Thomasville is surrounded by a fertile section producing cotton, sugar-cane, tobacco, melons, figs, pears, grapes, and vegetables. Its manufacturing interests are centred mainly in the lumber industry. The government is vested in a mayor, chosen annually, and a council. The water-works are owned and operated by the municipality. Thomasville was settled in 1850 and received its present charter in 1889. Population, in 1890, 5514; in 1900, 5322.

THOMÉ, tō'mā', FRANÇOIS (commonly called Francis) (1850—). A French composer, born at Port-Louis, Mauritius. From 1866 to 1870 he attended the Paris Conservatoire, studying pianoforte with Marmontel and theory with Duprato. In 1890 he set *Roméo et Juliette* to music and in 1891 the mystery *L'enfant Jésus*, besides the symphonic ode *Hymne à la nuit*. He has also set many light stage pieces to music and published both vocal and instrumental pieces.

THOMIST, thō'mĭst. A follower of Thomas Aquinas (q.v.) in philosophy or theology. See ALEXANDRISTS.

THOMMEN, tôm'men, ACHILLES (1832-93). An Austrian engineer, born at Basel, and educated at the university of his native town and in the polytechnic institute of Karlsruhe. He built the railroad over the Brenner Pass in 1861-67. From 1867 to 1869 he was head of the railroad system of Hungary.

THOMPSON, tŏmp'son. A town, including several villages, in Windham County, Conn., four miles northeast of Putnam, on the Quinebaug River, and on the New York, New Haven and Hartford Railroad (Map: Connecticut, H 2). Farming and the manufacture of cotton goods and woolens are the leading industries of the community. Originally a part of Killingly, Thompson became a parish in 1728, and was incorporated as a town in 1780. Population, in 1890, 5580; in 1900, 6442.

THOMPSON. A family of American painters. CEPHAS GIOVANNI the Elder (1775-1856), a mediocre portrait painter, born at Middleboro, Mass., practiced mainly in the South, numbering among his sitters John Marshall, John Howard Payne, and Decatur.—CEPHAS GIOVANNI the Younger (1809-88), portrait and figure painter, born also at Middleboro and for a short time the pupil of his father, was chiefly self-taught. He painted principally in Boston, Providence, New York, and Philadelphia. In 1852 he visited London, Paris, and Florence, and settled in Rome, where he spent seven years. Upon his return to the United States in 1860 he took up his residence in New York City, and was made an associate of the National Academy. His portraits include those of Longfellow, Charles Fenno Hoffman (New York Historical Society), Sebastien Cabot (after Holbein), Hawthorne, and Dr. Matthews (New York University). Among his best known figure paintings are the "Guardian Angels," "Prospero and Miranda," and "Saint Peter Delivered from Prison." His most celebrated picture is his copy of Guido Reni's "Beatrice Cenci."—His brother JEROME THOMPSON (1814-86), landscape and figure painter, studied for a short time under his father and then with Morse and Jarvis. He painted chiefly in New York City, where he took up his residence in 1832. In 1850 he was made an associate of the National Academy. Among his paintings are the "Old Oaken Bucket," the "Dakota Cañon" (1880), the "Indian's Prayer" (1884), and a "Study from Nature" (1886).

THOMPSON, AUGUSTUS CHARLES (1812-1901). A Congregational clergyman. He was born at Goshen, Conn.; studied at Yale College (but did not graduate), at Hartford Theological Seminary, and the University of Berlin. He became pastor of the Eliot Congregational Church, Roxbury, Mass. (1842). He visited India with Dr. Rufus Anderson (1854-55) and lectured on foreign missions at Andover Theological Seminary (1877-80), at Boston University (1882), and at Hartford Theological Seminary (1885-86). His publications include memorials of Mrs. Anna J. Waters (1854), of H. M. Mill (1856), of Rev. Dr. Rufus Anderson (1880); *Moravian Missions*

(1882); *Foreign Missions* (1889); *Protestant Missions* (1894); *Eliot Memorial* (Boston, 1900); and numerous works of a popular character.

THOMPSON, Benjamin. See Rumford, Benjamin Thompson, Count.

THOMPSON, Daniel Greenleaf (1850-97). An American lawyer and psychological writer. He took his B.A. at Amherst College (1869); was admitted to the bar in New York in 1872, but soon devoted his time mainly to the psychology of religion and sociological subjects, and is chiefly known for his *System of Psychology* (London, 1884), *The Problem of Evil* (London, 1887), and *The Religious Sentiments of the Human Mind* (London, 1888), in all of which he takes a position of violent antagonism to various accepted orthodox dogmas.

THOMPSON, Daniel Pierce (1795-1868). An American lawyer, politician, and novelist, born at Charlestown, Mass. He graduated at Middlebury College (1820), went to Virginia as tutor; studied law there, and was admitted to the bar (1823). He settled in Montpelier, Vt., in 1824, held various legal offices in that State, compiled, by legislative appointment, *Laws of Vermont from 1824 down to and including the Year 1834* (1835), was Secretary of State of Vermont (1853-55), and editor of a political weekly, *The Green Mountain Freeman* (1849-56). His first novel was a satire on the Anti-Masonic agitation, *The Adventures of Timothy Peacock* (1835). In the same year he wrote a prize story, *May Martin, or the Money Diggers.* Much popularity was achieved by *The Green Mountain Boys* (1840) and *The Rangers* (1850), romances of Revolutionary Vermont. He also wrote a *History of Montpelier, 1781-1860* (1860).

THOMPSON, David (1770-1857). A Canadian explorer, born in Westminster, England. He was educated at Oxford and in 1789 came to America in the service of the Hudson's Bay Company. For several years he was engaged in explorations in the region of the Great Lakes, in 1798 discovered Turtle Lake, one of the sources of the Mississippi, and in 1807-11 crossed the Rocky Mountains and explored the Columbia River from source to mouth. In 1797 he became connected with the Northwest Company. He was engaged in the Canadian-United States boundary survey from 1816 to 1826, and subsequently had charge of extensive surveying and exploring expeditions in the Canadian Northwest. He published *A Map of the Northwest Territory of the Province of Canada* (1814).

THOMPSON, Denman (1833—). An American actor, best known for his impersonation of the rustic 'Josh' Whitcomb. He was born in Erie County, Pa., but passed much of his boyhood in Swanzey, N. H., where he found some of the types that he later made famous. He made his début upon the stage at Lowell, Mass., in 1852. *Joshua Whitcomb* was first brought out in 1875. In 1886 Mr. Thompson produced *The Old Homestead,* in which the same leading character appears, and this play became the material of all his subsequent popularity. It ran for four successive seasons in New York (1888-91) and its simple pictures of country life afford perhaps the best example of its type of rural drama. Consult McKay and Wingate, *Famous American Actors of To-Day* (New York, 1896).

THOMPSON, Sir Edward Maunde (1840—). An English antiquary, born in Jamaica, West Indies. After studying at Rugby and at University College, Oxford, he was called to the bar at the Middle Temple in 1867. In 1861 he was appointed assistant in the British Museum; in 1878 he became keeper of the manuscripts and Egerton librarian; and in 1888 principal librarian. He was Sandars reader in bibliography at Cambridge (1895-96), and was knighted in 1895. Editions by him include: *Chronicon Angliæ,* 1328-88, in the "Rolls Series" (1874); *Letters of Humphrey Prideaux,* for the Camden Society (1875); *Chronicon Adæ de Usk,* 1377-1404, for the Royal Society of Literature (1876); *Correspondence of the Family of Hatton,* for the Camden Society (1878); *Diary of Richard Cocks in Japan,* 1615-22, for the Hakluyt Society (1883); *Handbook of Greek and Latin Palæography* (1893); and, jointly with Professor Jebb, the facsimile of the "Laurentian Sophocles," for the Hellenic Society (1885). He is also joint editor of the publications of the London Paleographical Society.

THOMPSON, Francis (c.1859—). An English poet, the son of a Lancashire physician. He was educated at the Ushaw Roman Catholic College, near Durham, and then studied medicine at Owens College, Manchester. Giving up medicine, he went to London, where, after a sharp struggle with poverty, he suddenly found himself famous. His *Poems* (1893) ran through several editions, receiving high praise from the reviewers and from Browning. This volume was followed by *Sister Songs* (1895) and *New Poems* (1897). In the matter of technique Thompson is one of the most original and daring of the younger generation of English poets; and in poetic quality he reveals an imaginative spirituality lingering near to mysticism.

THOMPSON, George (1804-78). An English abolitionist. He was born in Liverpool, England, and first became known in 1833 by his lectures in connection with the anti-slavery agitation throughout the British colonies. He was largely instrumental in procuring the freedom of the slaves and the abolition of the apprenticeship system. He was a member of the Anti-Corn Law League, and also took an active part in forming the British India Association, which procured better government for the people of India. He was associated with Garrison, Whittier, and others in the anti-slavery movement in the United States, and a visit which he paid to that country in 1834 led to the formation of upward of 150 anti-slavery societies. He belonged to the National Parliamentary Reform Association of England, and from 1847 to 1852 was a member of Parliament for the Tower Hamlets district, London.

THOMPSON, Sir Henry (1820-1904). An English surgeon, born in Framlingham, Suffolk. He was educated at University College, London, and was appointed assistant surgeon of the University College Hospital, London, in 1856; surgeon in 1863; professor of clinical surgery in 1866; and consulting surgeon in 1874. In 1884 he was professor of surgery and pathology in the Royal College of Surgeons, London. His essays on the *Pathology and Treatment of Stricture of the Urethra* (London, 1853), and *The Healthy and Morbid Anatomy of the Prostrate Gland* (London, 1860), each won for him the Jacksonian prize of the Royal College of Surgeons. In 1864 he became surgeon extraordinary to Leopold I. (by whom, owing to the success of an operation. he was knighted in 1867) and in 1868 to his successor, Leopold II. In 1864 he was made an officer of the Order of Leopold, and in 1876 was promoted commander. He studied painting, and frequently exhibited pictures at the Royal Academy (London), the Salon (Paris), and elsewhere. He first brought the question of cremating dead human bodies before the English public, and in 1874 started the Cremation Society of London. He was a voluminous writer. His best known works include: *Practical Lithotomy and Lithotrity* (London, 1863); *Clinical Lectures on Diseases of the Urinary Organs* (ib., 1868); *Modern Cremation* (ib., 1890); *On Food and Feeding* (ib., 1901); and the novels *Charley Kingston's Aunt* and *All But*, which appeared under the pseudonym of "Pen Oliver."

THOMPSON, Jacob (1810-85). An American politician, born in Caswell County, N. C. He graduated at the University of North Carolina and in 1834 he was admitted to the bar, and in the next year removed to the Chickasaw country in Mississippi. From 1839 to 1851 he was a member of the United States House of Representatives, served as chairman of the Committee on Indian Affairs, and advocated non-acceptance of the Compromise of 1850. In 1857 he became Secretary of the Interior, and greatly systematized the work of the department, though the defalcation of a trusted clerk clouded his administration. In January, 1861, he resigned and was appointed aide to General Beauregard, and served with him through the Shiloh campaign. From 1862 to 1864 Thompson was Governor of Mississippi. In the latter year he was sent as Confederate commissioner to Canada, and to organize the Confederate sympathizers in Ohio, Indiana, and Illinois. Unsuccessful attempts were made to capture the gunboat *Michigan*, and to organize the escaped Confederate prisoners and to take Camp Douglas, free the prisoners there confined, and take Chicago. After the assassination of Lincoln Thompson was charged with complicity, and a price was put upon his head. He escaped to Europe, however, and remained there some time. When he returned he was not brought to trial, though a civil suit was brought in 1876 for the money taken by the dishonest clerk while Thompson was Secretary of the Interior.

THOMPSON, James Maurice (1844-1901). An American novelist, poet, and journalist, born in Fairfield, Ind. His boyhood was spent chiefly in Kentucky and Georgia. He served in the Confederate Army and after the war returned to Indiana, and practiced law and civil engineering at Crawfordsville. From 1885 to 1889 he was State geologist. In 1890 he went to New York and joined the editorial staff of the *Independent*, having already made a name for himself in literature by *Hoosier Mosaics* (1875), *The Witchery of Archery* (1878), *A Tallahassee Girl* (1882), *His Second Campaign* (1882), *Songs of Fair Weather* (1883), *At Love's Extremes* (1885), *By-Ways and Bird Notes* (1885), *The Boy's Book of Sport* (1886), *A Banker of Bankersville* (1886), *Sylvan Secrets* (1887), *The Story of Louisiana* (1888), and *A Fortnight of Folly* (1888). His later writings include: *Poems* (1892); *King of Honey Island* (1892); The *Ethics of Literary Art* (1893); *The Ocala Boy* (1895); *My Winter Garden* (1900), good impressionist descriptions of sub-tropical Louisiana; and *Alice of Old Vincennes* (1900), a very popular novel and his best. Posthumously printed were two immature novels, *Sweetheart Manette* and *Milly* (1901).

THOMPSON, John Reuben (1823-73). An American journalist and poet, born in Richmond, Va. He graduated at the University of Virginia (1844), practiced law in Richmond, became in 1847 editor of the *Southern Literary Messenger*, which for twelve years he made very influential. In it appeared early writings of D. G. Mitchell, John E. Cooke, Philip P. Cooke, Paul Hayne, and Henry Timrod. In 1859 he moved to Augusta, Ga., to edit *The Southern Field and Fireside*. The Civil War drove him in 1863 to London, where he wrote for English magazines in defense of the Confederacy. After the war he returned to America and was literary editor of the New York *Evening Post* till 1872. His poems enjoyed great local popularity. Most admired among them are "The Burial of Latane" and "The Death of Stuart."

THOMPSON, Sir John Sparrow David (1844-94). A Canadian political leader, born at Halifax, Nova Scotia. He received a common-school education and was admitted to the bar in 1865. Here his ability and industry soon placed him in the first rank. He took an active interest in politics and in 1877 was elected to the Provincial Assembly. The next year he was appointed Attorney-General and in 1881 he became Premier. In 1882 he was appointed a justice of the Superior Court of Nova Scotia, but in 1885 he gave up this position to accept the portfolio of Minister of Justice in the Dominion Government, and in 1886 he brilliantly defended the conduct of the Administration in regard to Louis Riel (q.v.). The next year he was chosen legal adviser to the British plenipotentiaries who negotiated the fisheries treaty of 1887 with the United States, and as a reward for his services was made a knight commander of Saint Michael and Saint George. In 1892 he became Prime Minister of Canada and in 1893 one of the arbitrators on the Bering Sea Controversy (q.v.). He died the next year while in Windsor Castle, where he had just taken the oath as a member of the Queen's Privy Council.

THOMPSON, Joseph Parrish (1819-79). An American clergyman and scholar, born in Philadelphia. He graduated at Yale in 1838, was ordained a Congregational minister in 1840, was pastor in New Haven (1840-45) and New York (1845-71), lecturer on Egyptology at Andover (1871), and engaged in Oriental studies, chiefly in Berlin, from 1872 till his death. Thompson aided in establishing the New York *Independent*. Among his publications the more noteworthy are: *Egypt, Past and Present* (1856); *Man in Genesis and Geology* (1869); *Church and State in the United States* (1874); *The United States as a Nation* (1877); *The Workman, His False Friends and His True Friends* (1879). His political and social essays are gathered in *American Comments on European Questions* (1884).

THOMPSON, Launt (1833-94). An American sculptor. He was born in Abbeyleix, Queen's County, Ireland, but came to America in 1847, settling at Albany. He studied anatomy for a short time, and then became a pupil and assistant of Erastus Palmer, the sculptor. In 1858 he opened a studio in New York City, where he was first brought into public notice by his exquisite medallion heads. Later he executed some striking portrait busts and statues. He was made a member of the National Academy in 1862. In 1868 he went to Rome for a year, and in 1875-87 again visited Italy, residing principally at Florence. Among his works are a medallion portrait of John A. Dix; portrait bust of William Cullen Bryant (Metropolitan Museum); a colossal statue of Napoleon (Metropolitan Museum), of John Sedgwick (West Point), Winfield Scott (Soldiers' Home, Washington), and one of Abraham Pierson, first president of Yale College (1874).

THOMPSON, Mortimer (1832-75). An American journalist and humorist, born at Riga, Monroe County, N. Y. He studied at the University of Michigan, contributed humorous articles to the *Advertiser* of Detroit, and afterwards was a writer for the New York *Tribune,* in which were published his series of letters from Niagara Falls and his account of the Pierce-Butler slave-auction at Savannah, printed by the Anti-Slavery Society as a tract. For several years he was a popular lecturer. He published under the pseudonym 'Q. K. Philander Doesticks, P.B.'—interpreted by him as 'Queer Kritter, Philander Doesticks, Perfect Brick'—a number of volumes, including *Doesticks—What He Says* (1855); a parody of *Hiawatha, Plu-ri-bus-tah: A Song That's by No Author* (1856); and *Nothing to Say, Being a Satire on Snobbery* (1857).

THOMPSON, Richard Wigginton (1809-1900). An American political leader, born in Culpeper County, Va. In 1831 he removed to Louisville, Ky., but soon afterwards went to Lawrence County, Ind., where in 1834 he was admitted to the bar. In 1840 he was elected to Congress, and in 1847 was again elected. He was appointed judge of the Fifth Indiana Circuit in 1867, and in 1877 was Secretary of the Navy in the Cabinet of President Hayes. His publications include: *The Papacy and the Civil Power* (1876); *History of Protective Tariff Laws* (1888); *Personal Recollections of Sixteen Presidents* (1894); and *Footprints of the Jesuits* (1894).

THOMPSON, Robert Ellis (1844—). An American educator, born near Lurgan, Ireland. At an early age he emigrated to the United States, and in 1865 graduated at the University of Pennsylvania. Two years later he was licensed to preach by the Reformed Presbytery of Philadelphia, but from 1868 until 1892 was a professor in the University of Pennsylvania. In 1894 he became principal of the Philadelphia Central High School. He edited the *Penn Monthly* from 1870 to 1881, and the *American Weekly* from 1881 to 1892; edited vols. i. and ii. of the *Encyclopædia Americana,* supplement to the *Encyclopædia Britannica* (1884-85); and published a number of books, including: *Social Science and National Economy* (1875); *A History of the Presbyterian Churches of America* (1895); and *Political Economy for High Schools* (1895).

THOMPSON, Silvanus Phillips (1851—). An English physicist. He was born at York, and was educated at the Royal School of Mines and the University of London, where he received the degrees of B.A. (1869), B.Sc. (1876), and D.Sc. (1878). After serving as science master at Bootham School, York, he was lecturer and professor of experimental physics in the University College, Bristol, and in 1885 he became principal and professor of physics in the City and Guilds Technical College, Finsbury. Professor Thompson has done much to spread knowledge of electricity, while at the same time he has carried on original researches. His books on electricity and physics have passed through numerous editions. Of these, *Elementary Lessons in Electricity and Magnetism* (1st ed. 1881), *Dynamo Electric Machinery* (1st ed. 1885), *Light, Visible and Invisible* (1897), and *Polyphase Electric Currents and Alternate-Current Motors* (1895) are well known, as is his *Michael Faraday: His Life and Work* (1898).

THOMPSON, Smith (1768-1843). An American jurist and statesman. He was born in Stanford, Dutchess County, New York; graduated at Princeton College in 1788, and was admitted to the bar in 1792, having studied under Chancellor Kent. After serving as a member of the New York Legislature (1800) and of the State Constitutional Convention (1801), and receiving other political honors, he became associate justice of the State Supreme Court (1802-14), and Chief Justice (1814-18). In 1818 he became Secretary of the Navy in Monroe's Cabinet, and in 1823 was appointed to the United States Supreme Court, of which he remained a justice until his death.

THOMPSON, Thomas Perronet (1783-1869). An English general and political reformer. He was born in Hull and was educated at Queen's College, Cambridge. He took part in the Buenos Ayres campaign, 1807, and in 1808 was made Governor of Sierra Leone. His recall to England in 1810 was due to the influence of the slave-traders, against whose traffic he had taken active measures. He was with the British army in the Peninsular and French campaigns of 1813 and 1814, and in the Indian Pindari campaign of 1818. In 1820, with a small force, he was defeated at Sur, on the Arabian coast, by a band of Arabs, whom he was attempting to punish for piracy. He returned to England and in 1824 became one of the founders, and later proprietor, of the *Westminster Review,* to which he was a versatile and prolific contributor. His best known publications are the *Catechism on the Corn Laws* (1827), and *The Catholic State Waggon* (183?), in favor of Catholic emancipation. A collection of his miscellaneous writings was published with the title *Exercises, Political and Other* (6 vols., 1842). He was elected to Parliament in 1835, 1847, and 1857. He became general in 1868.

THOMPSON, Waddy (1798-1868). An American legislator and diplomat, born in Pickensville, S. C. He graduated at the South Carolina College in 1814 and in 1819 was admitted to the bar. From 1835 to 1841 he was a member of the National House of Representatives as a Whig, and in 1840 was chairman of the Committee on Military Affairs. In 1842-44 he was Minister to Mexico, and secured the release of 200 Texan prisoners. He published *Recollections of Mexico* (1846).

THOMPSON, William (1725-81). An American soldier. He was born in Ireland, emigrated to Pennsylvania, served (1759-60) as captain of militia in the French and Indian War, and in June, 1775, was placed in command of eight Pennsylvania companies, with the rank of colonel. In January, 1776, he took the same rank in the regular Continental Army, and on March 1st became brigadier-general. On March 19th he relieved General Charles Lee at New York, and in April led fourteen regiments to Canada to reinforce General John Thomas, assuming chief command during Thomas's illness and holding it until the arrival (June 4th) of General Sullivan. He led the Americans in the unsuccessful attack on the English at Three Rivers (June 6th), and was taken prisoner. Though immediately paroled, he was not exchanged until October 25, 1780.

THOMPSON, William Tappan (1812-82). An American journalist and humorist, born at Ravenna, Ohio. He removed to Philadelphia, subsequently to Florida, and thence, in 1835, to Augusta, Ga., where he was attached to the staff of several literary weekly papers and to the *Miscellany*, of Madison, Ga., he began to contribute the "Major Jones Letters," upon which his fame as a humorist rests. They were published in book form as *Major Jones's Courtship* (1840). In 1850 he established at Savannah the *Morning News*, which he continued to edit during the remainder of his life. In the Civil War he served in the Confederate Army as a private and on the staff of General J. E. Brown. He published *Major Jones's Chronicles of Pineville* (1843) and *Major Jones's Sketches of Travel* (1848).

THOMPSON, Wordsworth (1840-96). An American genre and historical painter. He was born in Baltimore, Maryland, and studied at Paris under Gleyre and Pasini. In 1868 he opened a studio in New York City, and was made a member of the National Academy in 1875, and of the Society of American Artists two years later. He is best known as a painter of American historical subjects. Among his paintings are the "Review at Annapolis, Maryland, 1776" (Buffalo Academy); "Passing the Outpost" (Union League Club, New York); a "New England Homestead," which won a gold medal at the Paris exhibition, 1889; and his last and best work, "Old Bruton Church, Virginia, in the time of Lord Dunmore" (Metropolitan Museum).

THOMS, tŏmz, William John (1803-85). An English antiquary, born in London. For several years, up to 1845, he was a clerk at Chelsea Hospital, and then was appointed clerk of the House of Lords; and from 1863 to 1882 he was its deputy librarian. In recognition of his scholarship he was elected a fellow of the Society of Antiquaries (1838) and secretary of the Camden Society (1838-73). Thoms is most widely known as the founder of *Notes and Queries*. Thoms published a large number of books of great value to the student and to the curious. Among them are *Early Prose Romance* (1827-28; revised by another hand, 1858); *Lays and Legends of Various Nations* (1834); *Anecdotes and Traditions Illustrative of Early English History and Literature* (Camden Society, 1839); *Hannah Lightfoot* (1867); the *Death of Charles I.* (1872); and *Human Longevity* (1873). Consult Thoms's reminiscences under the title, "Gossip of an Old Bookworm" (*Nineteenth Century*, London, July and December, 1881).

THOMSON, tôn'sôn', César (1857—). A Belgian violinist, born at Liège. He made successful tours through Spain and Italy and became a member of Bilse's orchestra at Berlin. He gave instruction on the violin at the Liège Conservatory from 1883 to 1897. In 1894 and 1895 he made trips to the United States, and became Ysaye's successor as professor of violin-playing at the Brussels Conservatory in 1898. He is noted for his double-stop technique and for his clean-cut bowing.

THOMSON, tŏm'son, Charles (1729-1824). An American patriot. He was born in County Derry, Ireland, and in 1740 was brought to New Castle, Del. He was educated at New London, Pa., and when very young assumed charge of the Friends' Academy at New Castle. He took an active interest in all the controversies between the colonies and the British Ministry, and, removing to Philadelphia in 1774, was chosen secretary of the Continental Congress, in which capacity he served until 1789, keeping a careful record of all the proceedings and making copious notes of the debates. John Adams (in his diary for September 30, 1774) speaks of him as "the Sam Adams of Philadelphia, the life of the cause of liberty." In 1789 he was delegated to announce to Washington, at Mount Vernon, his election to the Presidency. He published *An Enquiry into the Causes of the Alienation of the Delaware and Shawanese Indians* (1759); an able translation of the Bible, containing the first English version of the Septuagint (4 vols., 1808); and a *Synopsis of the Four Evangelists* (1815). He also prepared a history of the Revolution, which, however, he destroyed in manuscript. Consult Harley, *The Life of Charles Thomson* (Philadelphia, 1900).

THOMSON, Charles Edward Poulett, Baron Sydenham (1799-1841). A British Governor-General of Canada, born at Wimbledon, Surrey. He was chosen a member of Parliament from Dover in 1826, and attracted attention by his discussion of economic questions. He was appointed Governor-General of Canada in 1839, and effected the union of the provinces in spite of the conflicting interests and jealousies. The adoption of the Constitution, February 10, 1841, led to the confederation of 1867. In recognition of his services Thomson was raised to the peerage as Baron Sydenham of Kent and Toronto, August 19, 1840, and was created Knight of the Grand Cross of the Bath. While preparing to return to England he was fatally injured by being thrown from his horse.

THOMSON, Sir Charles Wyville (1830-82). A British naturalist, born in Scotland as Wyville Thomas Charles, which name was changed when he was knighted. He was educated in medicine, but turned his attention to botany, and afterwards to a broader consideration of natural history, and became in 1853 professor of natural history in Queen's College, Cork. In 1860 he became professor of natural science at Belfast, and in 1870 at the University of Edinburgh. He early became interested in problems relating to life in the deeper parts of the sea, and in 1868, with Dr. W. B. Carpenter, made investigations north of Scotland in the gunboat *Lightning.* Other ocean voyages for scientific sounding and dredging were conducted subsequently, and their results were popularly explained in *The Depths of the Sea* (1873), a volume which attracted much attention. The interest thus aroused was influential in causing the British Government to undertake the renowned *Challenger* (q.v.) exploring expedition, the scientific conduct of which was given to Professor Thomson. The successful and brilliant outcome of this undertaking was recognized at its close, in 1876, by the conferring of knighthood upon Thomson and by scientific honors from all parts of the world. Sir Wyville resumed his lectures at the university, and began to superintend the disposal of the scientific material from the expedition, placing it in the hands of specialists to be exhaustively studied. He prepared at once a general narrative, *The Voyage of the Challenger* (2 vols., 1877), but became ill in 1879 and died in 1882. Besides the books mentioned, he was the author of more than forty papers of importance published in scientific periodicals, relating largely to marine zoölogy and especially to echinoderms, recent and fossil. He devised many of the methods and invented much of the apparatus used in deep-sea exploration (q.v.).

THOMSON, Edward (1810-70). A Methodist Episcopal bishop. He was born at Portsea, England; came to America in 1818 and settled in Wooster, Ohio. He graduated from the medical department of the University of Pennsylvania in 1829, and practiced medicine in Jeromeville and Wooster. He joined the Ohio Conference in 1833 and was stationed at Norwalk and Sandusky. In 1836 the Michigan Conference was formed and by the division of territory he became a member of that body, and was stationed at Detroit. He was principal of Norwalk Seminary, 1838-1843; editor of the *Ladies' Repository,* 1844-1845; president of Ohio Wesleyan University 1846-1860; editor of the *Christian Advocate and Journal,* New York, 1860-64. He was elected bishop in 1864; soon after his election he made a world-wide survey of Methodist missions, among many other things organizing the India Mission into an annual conference. He published *Moral and Religious Essays* (1856); *Educational Essays* (1856); *Sketches, Biographical and Incidental* (1856); *Letters from Europe* (1856); *Our Oriental Missions* (1870); *Evidences of Revealed Religion* (1872);

THOMSON, Elihu (1853—). An American electrician. He was born in Manchester, England, and came to the United States in 1858. He was educated in the Philadelphia public schools and was professor of chemistry and mechanics in the Central High School there from 1870 to 1880. Meanwhile he devoted much attention to the study of electricity, and lectured on that science at the Franklin Institute. In 1880 he became electrician to the American Electric Company, and thereafter devoted his attention to invention, especially as relating to arc lighting, incandescent lighting, motor work inducting systems, and especially electric welding. He organized the Thomson-Houston Electric Company for the development of his inventions, and subsequently became associated with the General Electric Company.

THOMSON, George (1757-1851). A Scottish composer, born at Limekilns, Fife. He was a constant and untiring collector of Scotch, Welsh, and Irish melodies and had the most celebrated musicians of that period engaged in writing accompaniments for them. Each song contained a prelude, code, and ad libitum parts throughout for violin, flute, or 'cello. Among his works are *A Select Collection of Original Scottish Airs; A Collection of Songs of Robert Burns, Sir Walter Scott, etc.* (1822); *Select Collection of Original Welsh Airs* (1809); and a *Select Collection of Original Irish Airs* (1814 to 1816); besides twenty Scottish melodies (1839). He died at Leith.

THOMSON, James (1700-48). A Scottish poet, born at Ednam, a village in Roxburghshire, where his father was minister. After attending school at Jedburgh Abbey by the Tweed, he was sent to the University of Edinburgh (1715) with a view to the Church. Forsaking all thought of the ministry, he went to London to seek fame and fortune in poetry (1725). Though poor, he was well received by the Duke of Montrose and others, who helped him bring out *Winter* (1726). This poem was followed by *Summer* (1727) and *Spring* (1728). In 1730 appeared *Autumn,* bound with the previous poems, under the title of *The Seasons.* These poems, issued separately and collectively, were from the first successful, and were exceedingly popular for a full century. They marked the return of blank verse, and a feeling for nature, of which there had been very few traces since Milton. With *The Seasons* the literary historian dates the beginning of the romantic movement in English literature. Appointed in 1730 tutor to the son of Sir Charles Talbot, afterward Lord Chancellor, Thomson traveled for three years in France and Italy. On the death of his pupil (1733), he returned to London and was immediately appointed by the Lord Chancellor secretary of briefs, a sinecure, at a salary of £300 a year. He was now able to settle in a pretty cottage at Richmond. The death of his patron in 1737 put an end to his sinecure; but through Lyttleton he obtained from the Prince of Wales a pension of £100 (1738). At this time he revised *The Seasons,* enlarging greatly each poem. The new edition was published in 1744. In 1740 appeared *The Masque of Alfred,* written by Thomson and David Mallet and containing Thomson's famous ode, "Rule Britannia," the national patriotic hymn of England. At Richmond, too, was written Thomson's finest poem, *The Castle of Indolence* (1748). For it he employed the Spenserian stanza. The poem is exquisitely colored and reveals here and there rare gleams of imagination. Besides these significant and beautiful poems, Thomson was the author of several tragedies, of which *Sophonisba,* produced at Drury Lane (February 28, 1730), was the first, and *Tancred and Sigismunda,* produced at

Drury Lane by Garrick (March 18, 1745), was the most successful. A cenotaph to his memory was erected in Westminster Abbey by the side of Shakespeare's.

The Seasons had a wide vogue in both France and Germany, where translations and imitations were numerous. Thomson was thus a forerunner of the romantic revival, not only for England, but also for the Continent. The best edition of his *Works* is the Aldine (London, 1897), edited with a biography of Rev. D. C. Tovey. The best studies are *James Thomson, sa vie et ses œuvres*, by Léon Morel (Paris, 1895); and the essay in *Célébrités anglaises*, by Lefèvre Deumier (Paris, 1895). An account of Thomson's influence in France is given in *Cosmopolitisme littéraire au XVIIIème siècle*, by Joseph Texte (Paris, 1895; Eng. trans. by J. W. Matthews, New York, 1899). Consult also Dr. Johnson in *Lives of the Poets;* and the *Life* by W. Bayne, in the "Famous Scots" series (Edinburgh, 1898). See ROMANTICISM.

THOMSON, JAMES (1822-92). A Scotch professor of engineering and elder brother of William Thomson, Lord Kelvin, born at Belfast and educated at the University of Edinburgh. He settled as a civil engineer in Belfast, where in 1857 he was appointed professor of civil engineering in Queen's College. In 1873 he was elected professor in Glasgow University, succeeding W. J. M. Rankine (q.v.). He made many improvements in hydraulic machinery and predicted from theory the effect of pressure in lowering the freezing point of water. See REGELATION.

THOMSON, JAMES (1834-82). An English poet, born at Port Glasgow, Scotland. In 1840 his father was disabled by a paralytic stroke and two years later his mother died. He was educated at the Royal Caledonian Asylum (1842-1850) and then entered (1850) the Military Asylum, Chelsea, to qualify as an army schoolmaster. The next year he was sent as a teacher to Ballincollig, near Cork, where he fell in love with a beautiful girl, who died in 1853. After serving as schoolmaster at various other places, he was discharged from the service in 1862 for a trivial offense against discipline. Through the influence of his friend Charles Bradlaugh, he obtained a clerkship in London; and under the pen-name of Bysshe Vanolis, or shortened to B. V. (Bysshe, the middle name of Shelley and Vanolis, an anagram of Novalis), he began writing for the radical magazines. Except for a short period in the United States and as correspondent for the New York *World* in Spain (1873), he passed the last sixteen years of his life in a narrow London lodging. He died an inebriate in University College Hospital. Thomson was a thorough-going pessimist wholly out of joint with the ways of men. He first attracted attention as a poet with his *City of Dreadful Night* (in the *National Reformer*, 1874, reprinted with other poems in 1880), a lurid poem of great imaginative power. Hardly less impressive is the volume entitled *Vane's Story, Weddah and Om-el-Bonain, and Other Poems* (1881). The same year he collected some of his prose writings under the title *Essays and Phantasies*. After his death appeared *A Voice from the Nile, and Other Poems* (1884); *Satires and Profanities* (1884); and *Poems, Essays, and Fragments* (1892). Consult *Poetical Works*, ed. with memoir by Bertram Dobell (London, 1895); id., *Biographical and Critical Studies* (ib., 1896); and *Life* by H. S. Salt (ib., 1889).

THOMSON, JOSEPH (1858-94). A Scottish traveler. He was born in Dumfriesshire, and after studying at Edinburgh under Sir Archibald Geikie, joined Keith Johnson's African expedition (1878), and after the former's death became leader. He headed an expedition to Masai Land in 1882; went to Sokots in behalf of the Royal Niger Company in 1885, when he secured a part of the Central Sudan to Great Britain, and, after exploring the Atlas Mountains in Morocco (1888), visited the region between lakes Nyassa and Bangweolo. In all his journeys he avoided serious conflict with the natives. He published *To the Central African Lakes and Back* (1881); *Through Masai Land* (1885); *An African Romance* (1888, with Miss Harris-Smith); *Travels in the Atlas and Southern Morocco* (1889); and *Life of Mungo Park* (1890).

THOMSON, JOSEPH JOHN (1856—). An English physicist and Cavendish professor in the University of Cambridge. He was born at Manchester and was educated at Owens College in that city and at Trinity College, Cambridge, where he graduated with honors in 1880. In 1884 he became professor of experimental physics in the University of Cambridge. He visited Princeton University on the occasion of its sesquicentennial in 1896 and delivered there a series of lectures which have since been published, upon the Discharge of Electricity in Gases. In 1903 he again visited the United States, where he was received with high honors by the leading universities. To Professor Thomson, more than to any one else, is due the development of the modern ionic theory of electricity, the theoretical and experimental discussion of radio-activity, and the electrical theory of inertia of matter. Professor Thomson's papers on these subjects have been epoch-making. He is also the author of the following books: *On the Motion of Vortex Ring* (1883); *The Application of Dynamics to Physics and Chemistry* (1888); *Recent Researches in Electricity and Magnetism* (1893); *Elements of the Mathematical Theory of Electricity and Magnetism* (1895).

THOMSON, THOMAS (1773-1852). A Scotch chemist. He was educated at Saint Andrews and at Edinburgh. In 1796 he began to contribute to the *Encyclopædia Britannica* a series of articles on chemical subjects, which subsequently formed the basis of his *System of Chemistry* (1802). In 1817 he was appointed lecturer, and in 1818 regius professor of chemistry at the University of Glasgow. Thomson was the first to publish (*System of Chemistry*, 3d ed., 1807) a detailed account of Dalton's atomic theory, which had been communicated to him in a private interview (1804) and which Dalton himself did not publish until 1808. He was also the first English chemist to give laboratory instruction to students. His works include: *Elements of Chemistry* (1810); *An attempt to Establish the First Principles of Chemistry by Experiment* (1825; the analytical data of the elements were shown by Berzelius to be far from accurate); *Chemistry of Organic Bodies* (1838); *History of Chemistry* (1830-31); *History of the Royal So-*

ciety (1812); *Outlines of Mineralogy and Geology* (1836).

THOMSON, William, first Baron Kelvin (1824—). An English mathematician and physicist, born at Belfast. He graduated in 1845 from Saint Peter's College, Cambridge, and shortly afterwards was elected to a fellowship. He became professor of natural philosophy in the University of Glasgow in 1846, in which position he continued until 1899. While an undergraduate he published a paper *On the Uniform Motion of Heat in Homogeneous Solid Bodies and Its Connection with the Mathematical Theory of Electricity,* which was favorably received by scientists. He was for some time editor of the *Cambridge Mathematical Journal* and was the first editor of the *Cambridge and Dublin Mathematical Journal* which succeeded it, some of his most brilliant discoveries having appeared in these journals. He also contributed to the *Comptes Rendus,* the *Transactions and Proceedings* of the Royal Societies of London and Edinburgh, and various other journals. In the mathematical theories of elasticity, vortex-motion, heat, electricity, and magnetism, he made remarkable discoveries. Lord Kelvin was the electrical engineer for the Atlantic cables of 1857-58 and 1865-66, and made many improvements in signaling apparatus and theoretical observations of the greatest value. He invented the mirror galvanometer used for cable signaling, and then devised the siphon recorder still in use for receiving the signals. He also studied the properties of the cable, and his observation that a limit to the speed of operation would early be reached owing to the effect of the statical capacity has been borne out in a half century of practice. Lord Kelvin acted as engineer for several other cable companies and has invented many pieces of electrical apparatus and methods for measurement. He also developed an improved form of mariners' compass which is free from the magnetic action of the iron of the ship, and a deep-sea sounding apparatus, both of which are in widespread use. Lord Kelvin's work in thermodynamics is also of the greatest value. It was he who first appreciated the importance of the doctrine of the conservation of energy as enunciated by Joule and who developed Carnot's work on heat so that it would harmonize with the new theory then being generally accepted. A paper *On an Absolute Thermometric Scale* contains much that is now considered fundamental in thermodynamics. Lord Kelvin's many scientific papers, contributed to various scientific journals, have been collected in book form as follows: *Electrostatics and Magnetism,* 1 vol.; *Mathematical and Physical Papers,* 3 vols.; and *Popular Lectures and Addresses,* 3 vols. In conjunction with Professor P. G. Tait, Lord Kelvin is the author of *A Treatise on Natural Philosophy.* He received many honors from scientific societies, universities and governments, and is a member of the most important academies and learned organizations of Europe and America. Lord Kelvin visited America in 1884, and after attending the meeting of the British Association in Montreal, he visited Baltimore and delivered a course of lectures before the Johns Hopkins University, published under the title *Baltimore Lectures.* In 1897 he attended the Toronto meeting of the British Association and visited several of the leading universities of the United States. He came once more in 1902. For his work in connection with the Atlantic cable he was knighted in 1866, and in 1892 he was raised to the peerage. Four years later he celebrated his jubilee as professor of natural philosophy at Glasgow. Lord Kelvin may be said to represent the highest type of physicist, since he combines the powers of mathematical reasoning with the inventive faculty and manipulative skill of the experimentalist.

THOMSON, William McClure (1806-94). A Presbyterian missionary and writer. He was born in Springfield, Ohio, and graduated at Miami College, 1826; studied at Princeton Theological Seminary; and went as a missionary of the American Board to Syria and Palestine, 1832. The next year he went to Beirut and there resided till his return to America, 1877. His reputation rests upon his familiar work, *The Land and the Book, Biblical Illustrations Drawn from the Manners and Customs, the Scenes and the Scenery of the Holy Land* (1859; 2d ed. 1880-85).

THOMSON EFFECT. A thermal effect in an electric circuit where the temperature of the wire carrying the current varies from point to point. When the current is flowing in one direction along such a conductor, heat will be liberated at a given point, whereas if the current is reversed the heat at this point will be absorbed. The relative direction of the current and the absorption or liberation of heat depend upon the metal. In the case of iron the current passing from the hot to the cold portion absorbs heat, making the cold part cooler, while in the case of copper this takes place when the current flows from the cold portion to the hot. If the current is reversed, heat will be liberated under these circumstances. See Thermo-Electricity.

THOR, thôr. In Scandinavian mythology, the god of thunder. He was the son of Odin and Frigga, while his wife was Sif, or Love. His palace, where he received the warriors who had fallen in battle, was called Bilskirnir. Thunder was caused by the rolling of his chariot, which was drawn by he-goats. He was in the vigor of youth, had a red beard, and was the strongest of all the gods. He was a terror to the giants, with whom he was perpetually at strife, and whom he struck down with his hammer Mjolnir, or the smasher, which returned to his hand after being hurled. In the contest at the twilight of the gods, Thor slew the serpent of Midgard, but fell at the same time poisoned by the venom exhaled from its mouth. The name of Thor was widespread. The Saxons worshiped him as Thunar, and Torden, the wrathful deity dreaded by the Lapps, is evidently the Scandinavian Thor. The Gallic god Tarannis, or Tanarus, appears also to be indentical. Of all the Æsir (q.v.), Thor had unquestionably the most worshipers. In Norway he was the national god, and there, as in Iceland, temples were almost exclusively erected to him. Offerings were made to him, particularly in times of pestilence. Thursday was named for him. The heathen Scandinavians marked their rune-stones with the sign of the hammer of Thor. See Ragnarök; Scandinavian and Teutonic Mythology.

THORACIC DUCT (from Lat. *thorax,* from Gk. θώραξ, breastplate, part of the body covered by the breastplate, thorax). A canal equal in diameter to a goose-quill, proceeding from the *receptaculum chyli* (into which the contents of the lacteals are collected, and which is situated in the front of the body of the second lumbar vertebra), which ascends along the front of the vertebral column, between the aorta and ascending vena cava, as high as the fourth dorsal vertebra; it then inclines to the left, and passing behind the arch of the aorta, ascends as high as the seventh cervical vertebra, when it bends forward and downward, and empties into the subclavian at its junction with the internal jugular vein of the left side, where it is provided with a pair of semilunar valves, which prevent the admission of venous blood into it. It is also provided with other valves on its upward course. This duct is not liable to any special diseases, but if its function of conveying chyle from its source into the general circulation be interfered with, as, for example, by the pressure of a tumor, nutrition is impaired and there is often at the same time an accumulation of chylous fluid in the peritoneal cavity.

THORAH. See Torah.

THORAX. See Chest.

THORBECKE, tōr′bĕk-*e*, Heinrich (1837-90). A German Arabic scholar. He was born at Meiningen, and studied at Munich and Leipzig. He was appointed professor at Heidelberg (1873) and at Halle (1875). He is especially noted for his knowledge of Arabic poetry. He published: *Antarah, ein vorislamitischer Dichter* (1867); *Al-Harīrī's Durrat-al-gawwas* (1871); *Al-A'schâ's Lobgedicht auf Mahammed* (1875); *Ibn Duraid's Kitâb al-malâhin* (1882); *Die Mufaddalī-jät* (1885); *Mihail Sabbag's Grammatik der arabischen Umgangssprache in Syrien und Aegypten* (1886).

THOREAU, thŏ′rô *or* thô-rŏ′, Henry David (1817-62). An American naturalist and author. He was of French and Scotch extraction and was born at Concord, Mass., where his father was a manufacturer of lead pencils. At this trade the younger Thoreau worked at intervals. He graduated from Harvard College in 1837, and was for five or six years engaged in school teaching and tutoring in Concord and in Staten Island, N. Y. Preferring, however, to live a life of contemplation, he soon abandoned teaching and proceeded, during the rest of his days, to demonstrate how simply and agreeably a man might live. He was for a time an inmate of Emerson's house, but his most characteristic act was his residence, from July, 1845, to September, 1847, in a hut on the shores of Walden Pond, a beautiful body of water on the outskirts of Concord. Here he lived, doing what little work was necessary to supply the necessaries of life, and devoting the major part of his time to the study of nature and to the society of friends. On leaving Walden Pond, he again became an inmate of Emerson's house, 1847-48, and passed the remainder of his life, after 1849, with his parents and sister at Concord. During the entire period at Walden Pond and elsewhere in Concord, he supported himself by odd jobs of gardening, land surveying, carpentering, etc., but without more exertion than he needed to keep himself in food and clothing. His large amount of leisure time he devoted to the study of nature, to the reading of Greek, Latin, French, and English classical literature, to excursions, to pondering metaphysical problems, and to friendly chat with his neighbors, by whom he was beloved.

From 1837 till his death he kept a journal, and this furnished the source and basis of his writings, and gave them uniformity of character. Of the ten volumes which comprise his works in the standard Riverside edition (11 vols. with the *Familiar Letters* of Thoreau edited by F. B. Sanborn), but two appeared in his lifetime. The first of these, *A Week on the Concord and Merrimac Rivers* (1849), is the narrative of a boating trip taken in August, 1839; it is full of admirable description and minute observation of nature, not unmingled with divagations into transcendental philosophy. The second book records the experiences, physical and moral, of the two years' residence at Walden Pond: *Walden, or, Life in the Woods* (1854), perhaps his most popular volume, and now recognized as one of the most original and sincere productions in American letters and as one of the most genuine of woodland books. It gives a plain unaffected statement of the reasons for the author's life as a hermit, and an admirably specific account of the main details of that life. The other volumes, not much different in quality, were posthumously edited from his journal, and are, chiefly: *Excursions* (1863); *The Maine Woods* (1864); *Cape Cod* (1865); *Early Spring in Massachusetts* (1881); *Summer* (1884); *Winter* (1888); and *Autumn* (1892). Their publication indicated an increasing interest in Thoreau and a sense of the permanent value of his work—that of a sincere thinker and an observer of nature. The literary quality of the writing was high; he had a marked gift for style, and wrote with great care and unfailing freshness. His best essays, to be found in the volumes entitled *Miscellanies and Excursions*, are perhaps not excelled in American literature, whether for substance or for style, and it may be doubted whether the work of any of his contemporaries is wearing so well. His poems are interesting, but occupy a minor place in his writings, which are being increased by such publications as the *Essay on Service* (1902). There is a *Life* by F. B. Sanborn in the "American Men of Letters Series" (1882), and an admirable sketch by Emerson in *Biographical Sketches*. Channing's suggestive *Thoreau, the Poet-Naturalist* (1873-1902), biographies by A. H. Japp (1877) and H. S. Salt (1896), and essays by Lowell and Stevenson should also be mentioned; considerable space is given to Thoreau in the histories of American literature, and the list of books specially devoted to him is growing steadily.

THORENBURG, tō′ren-bōōrk (Hung. *Torda*). A town of the County of Torda-Aranyos, Hungary, 235 miles east-southeast of Budapest (Map: Hungary, H 3). Its salt mines and baths, still used, were known to the Romans. The modern town has a large manufactory of cellulose. Population, in 1900, 12,117.

THORESBY, thōrz′bĭ, Ralph (1658-1725). An English antiquary and topographer, born at Leeds. In 1679 he was left by his father's death in possession of a moderate fortune and the responsibilities of a business, which he somewhat neglected for his antiquarian studies and religious duties as a Presbyterian. He held several municipal offices at Leeds, but after 1705, when he retired from business with a competence, he devoted himself to his collections and writing. Though he was not an accurate scholar, his two chief works, *Ducatus Leodiensis* (1715) and *Vicasia Leodiensis* (1724), are important compilations. Consult: Hunter, *Thoresby's Diary and Correspondence* (London, 1830-32); Atkinson, *Ralph Thoresby the Topographer* (Leeds, 1885).

THORESEN, tŏ′râ-sen, Anna Magdalena (Kragh) (1819-1903). A Norwegian poet, born at Fredericia, in Jutland. She married a Norwegian clergyman and gained opportunity to study the peasant life and wilder nature of that country. Her sympathetic observations found literary expression in *Fortællinger* (Tales, 1863); *Signes Historie* (1864); *Solen i Siljedalen* (1868); *Billeder fra Vestkysten af Norge* (Pictures from the West Coast of Norway, 1872); *Nyere Fortællinger* (1873); *Herluf Nordal* (1879); she published also a volume of poems (1860); a drama, *Et Rigt Parti* (1870), and a final volume of tales (1891). Her earlier fiction was translated into German by Reinmar: *Gesammelte Erzählungen* (1878-1883).

THORITE. A mineral thorium silicate crystallized in the tetragonal system. It has a vitreous lustre, and is orange-yellow to dark brown in color. It is found at various places in Norway and in the Champlain iron region in northern New York, where, owing to the uranium oxide that it contains, it is called *uranothorite*.

THORIUM (Neo-Lat., from *Thor*, Scandinavian god of thunder). A metallic element discovered by Berzelius in 1828. It occurs in monazite, orangite, thorite, and other rare minerals containing the cerium group of metals, and found in Norway and in North Carolina. The metal may be obtained by decomposing the chloride with potassium or sodium. Thorium (symbol, Th; atomic weight, 232.63) is a gray powder which assumes an iron-gray lustre when burnished. It has a specific gravity of 10.96 and takes fire when heated in air, burning with a bright flame. It combines with oxygen, forming a white dioxide called thoria, and probably a peroxide or heptoxide. None of the compounds of this metal have any important commercial value except the dioxide, which has been used with zirconia in the mantle of the Welsbach burner.

THORN. See Cratægus.

THORN, tōrn. A strongly fortified town of Prussia, in the Province of West Prussia, on the right bank of the Vistula, which here divides into two branches, 87 miles northeast of Posen (Map: Prussia, H 2). There are many antique houses with striking architectural features. The ruins of a castle of the Teutonic Order, the Church of Saint John (1231-60), the Gothic Saint James (1309), and the Marienkirche (1367) are worthy of notice. There is a fine town hall containing a museum, library, and archives. In the market place stands a bronze statue of Copernicus, who was born here. There are iron foundries, and machine, tobacco, and soap works. The town carries on an active trade by water and by rail in corn, lumber, mineral waters, chocolate, and alcohol. Thorn was founded in 1231 by the Knights of the Teutonic Order. It became an important member of the Hanseatic League. It was annexed in 1454 to Poland. In 1466 a famous treaty of peace was concluded here between Poland and the Teutonic Knights (q.v.). The town became a part of Prussia in 1793. Population, in 1900, 29,626. Consult Kestner, *Beiträge zur Geschichte der Stadt Thorn* (Thorn, 1883).

THORNABY (thôr′nȧ-bĭ) **ON TEES**, formerly South Stockton (Map: England, E 2). A municipal borough in the North Riding of Yorkshire, England, suburban to Stockton (q.v.), with which its manufacturing industries and public works are identified. It is mentioned as Thormodby in Domesday. It was incorporated in 1892. Population, in 1891, 15,637; 1901, 16,053.

THORN ACACIA. See Locust Tree.

THORN-APPLE (*Datura Stramonium*). A coarse-growing, ill-smelling green-stemmed weed of the natural order Solanaceæ. It is well known locally in the United States as jimson weed or Jamestown weed, and is popularly feared for its reputed poisonous properties. See Stramonium.

THORN′HILL. A town in the West Riding of Yorkshire, England, 1½ miles south of Dewsbury. Its gas and water works, a modern system of sewerage, and electric street railway, are municipally owned industries. Population, in 1901, 10,290.

THORNHILL, Sir William. In Goldsmith's *Vicar of Wakefield*, the eccentric and kindly landlord of Dr. Primrose. He rescues the Vicar's daughter Sophia from his nephew, Squire Thornhill, when the latter had abducted her, and eventually marries her.

THORN′TON, Sir Edward (1817-1904). An English diplomat. He was born in London and was educated at King's College, London, and at Pembroke College, Cambridge. He entered the diplomatic service as attaché to the mission at Turin in 1842; filled the same position in Mexico in 1845, and was made secretary of legation in that capital in 1851. During 1848 he did much to forward the conclusion of the important Treaty of Guadalupe Hidalgo. In 1852 he was appointed secretary of legation at Buenos Ayres; chargé d'affaires to Uruguay (1854); Minister to the Argentine Republic in 1859; to Brazil in 1865; and from 1867 to 1881 to the United States. He was knighted in 1870; in 1871 was a member of the commission on the Alabama Claims, and was appointed Privy Councilor; and in 1873 was arbitrator in the commission on the Mexican and United States claims. He was appointed Ambassador at Saint Petersburg in 1881; Ambassador at Constantinople in 1884, and retired into private life in 1887.

THORNTON, John Wingate (1818-78). An American historian, born at Saco, Me. He graduated at the Harvard Law School in 1840, and became a practicing lawyer. His great interest, however, lay in genealogical and historical work, and he published a number of books along these lines, including: *The Landing at Cape Ann* (1854); *The First Records of Anglo-American Colonization* (1859); and *The Pulpit of the American Revolution* (1860). He was the founder of the New England Historical and Genealogical Society (1844). Consult Amory, *Memoir of J. W. Thornton* (Boston, 1879).

THORNTON, Matthew (1714-1803). A signer of the Declaration of Independence. He was born in Ireland; came to America in 1717, lived first at Wiscasset, Me., and then at Worcester, Mass., where he was educated; settled as a physician at Londonderry, N. H., and served as surgeon under Sir William Pepperell in the Louisburg expedition of 1745. He was chosen president of the provincial convention of 1775, and in 1776 was sent as a delegate to the Continental Congress, taking his seat in November, when he was allowed to sign the Declaration of Independence, though he had not been elected until some time after its passage. He was Chief Justice of the Court of Common Pleas prior to 1776, and from 1776 to 1782 was a judge of the New Hampshire Supreme Court.

THORN′WELL, James Henley (1812-62). A Southern Presbyterian theologian. He was born in Marlborough District, South Carolina, and graduated at South Carolina College, Columbia, 1831. He held several pastorates; was for a time president of South Carolina College, and held professorships in the theological seminary, Columbia. He published *Arguments of Romanists Discussed and Refuted* (1845); *Discourses on Truth* (1854); *On the Rights and Duties of Masters* (1861); *The State of the Country* (1861), and was one of the most orthodox and conservative of theologians. Consult his *Life and Letters* by B. M. Palmer (Richmond, 1875) and J. L. Girardeau (1871-73).

THORN′YCROFT. A family of English sculptors. Mary (1814-95), born in Thornham, Norfolk, was a pupil of her father, John Francis, the sculptor, and exhibited her first work at the Royal Academy in 1835. In 1840 she married Thomas Thornycroft, a fellow-pupil in her father's studio, with whom she went to Italy. At Rome she made the acquaintance of John Gibson, and upon his recommendation she received a commission from the Queen, after her return to London, to execute various statues and busts. Among these are the nine life-size statues of the royal children in the drawing-room at Osborne, and the royal children in a group, characterized as the "Four Seasons." Her ideal figures include the "Flower Girl," "Sappho," and the "Skipping Girl," which last is her best work. Her husband, Thomas Thornycroft (1815-85), devoted most of his time to mechanical schemes, but occasionally produced good sculpture, often assisted by his son Hamo. Among these are the statue of Charles I. (Westminster Hall), the group of "Commerce" on the Albert Memorial (Hyde Park), and equestrian statues of the Prince Consort at Liverpool and Wolverhampton.

Their son, William Hamo Thornycroft (1850—), was born in London, and was educated at University College School. In 1869 he entered the schools of the Royal Academy, exhibiting his first work in 1871, and the same year went to Italy. The careful study of the Elgin marbles and of Italian masters greatly influenced his work, and resulted in his vigorous "Teucer" (South Kensington Museum); "Putting the Stone," Artemis (Eaton Hall); "Medea," and "Lot's Wife." His athletic "Mower" (Liverpool Gallery) and the "Sower" are suggestive of the Barbizon school, although the spirit that pervades them is English. Other works include the national monument to General Gordon in Trafalgar Square; a statue of Queen Victoria in the Royal Exchange; and the Cromwell statue at Westminster. Thornycroft is likewise renowned for his portrait busts and bas-relief. A bust of Coleridge (1885) is in Westminster Abbey. He was made a Royal Academician in 1888, and received gold medals at the Royal Academy in 1875, and at the Paris Exposition, 1900.

THORNYCROFT, John Isaac (1843—). An English naval architect. He was born in Rome and was the son of Thomas and Mary Thornycroft. He early showed a decided aptitude for mechanics, and when only eighteen years old built a steam launch, the *Nautilus*, which was the fastest boat of its kind on the Thames. Some time before this he had constructed a little model steamer which contained several important innovations later introduced by him into his torpedo boats. About 1864 he entered the University of Glasgow, and after completing the engineering course there he opened a shipyard at Chiswick in 1866, and, in particular, achieved a remarkable success as a builder of torpedo boats. Among the improvements employed by him are the closed stoke-hold and fan, a special indicator, a water-tube boiler, and the turbine propeller. He contributed frequently to the *Transactions of the British Association* and to the publications of the Institution of Naval Architects and the Institution of Civil Engineers.

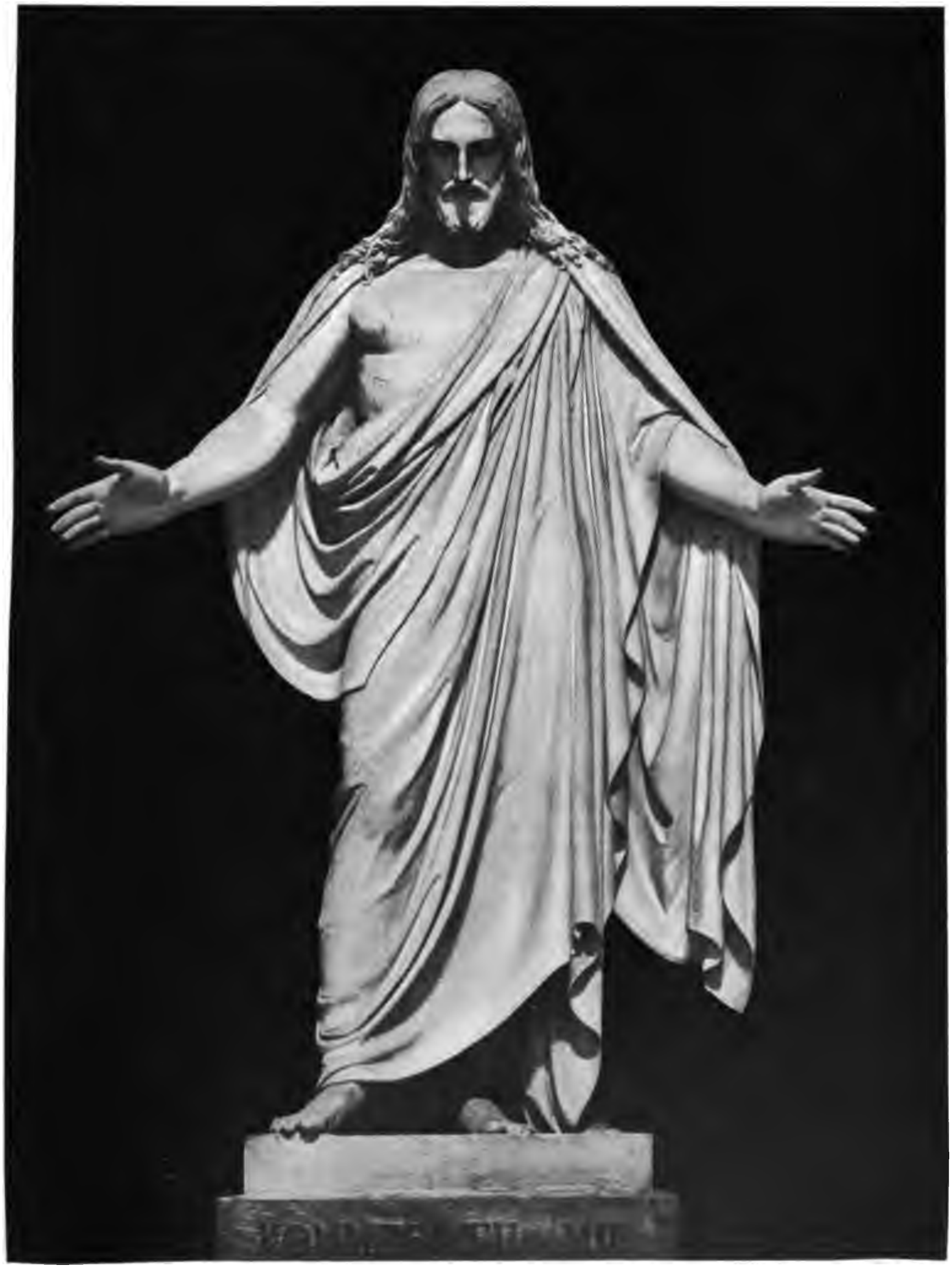
THÓRODDSEN, thôr′ôd-*sen*, Jón Thór Tharson (1819-68). An Icelandic novelist, born at Reykhólar. After studying law at the University of Copenhagen, he took part in the war against the Schleswig-Holstein insurgents and in 1850 returned to Iceland. He died at Borgarfjartharsysla. In point of both time and excellence, Thóroddsen is the first Icelandic novelist. His best known works are *Piltur og Stúlka* (Lad and Lass), his first novel, and *Mathur og Kona* (Man and Wife), published posthumously. These books are characterized by a faithful delineation of Icelandic life and by a quaint and pleasing humor. Thóroddsen also wrote a number of satirical poems.

THOR′OLD, Anthony Wilson (1825-95). An English bishop. He was born at Hougham, in Lincolnshire, and educated at Queen's College, Oxford, taking his degree in 1847; he entered the ministry and filled prominent positions in London from 1857 till he became Bishop of Rochester, 1877. In 1890 he was transferred to Winchester. He is best known as the author of the devotional works, of rare spirituality, *The Presence of Christ* (1869), *The Gospel of Christ* (1882), *The Yoke of Christ* (1884), *Questions of Faith and Duty* (1892), and *The Tenderness of Christ* (1894). Consult his *Life* by Simpkinson (London, 1896).

THOROUGHBASS. See Figured Bass.

THOROUGHWORT. See Eupatorium.

THORPE, Benjamin (1782-1870). An English philologist who studied at Copenhagen under the famous philologist Rasmus Christian Rask (q.v.). While there he published a translation of Rask's *Anglo-Saxon Grammar* (1830; rev. 1865). Returning to England in 1830, he continued his extensive studies in Old English and Old Norse. Now most widely known is his



THORWALDSEN

"CHRIST," FROM THE STATUE IN THE CHURCH OF OUR LADY AT COPENHAGEN

Northern Mythology, comprising the principal popular Traditions and Superstitions of Scandinavia, North Germany, and the Netherlands (3 vols., 1851). This work was supplemented by *Yule Tide Stories: a collection of Scandinavian Tales* (1853) and a translation of the *Edda of Sæmund the Learned* (1866). Thorpe's pioneer work in Old English translation, philology, and history, though in part superseded, is still of very great value. Among his publications in this department are *Cædmon's Metrical Paraphrase* (1832); *Analecta Anglo-Saxonica* (1834; 3d ed. 1868); *Ancient Laws and Institutes of England* (1840); *Codex Exoniensis, a Collection of Anglo-Saxon Poetry, with English Translation and Notes* (1842); *Anglo-Saxon Poems of Beowulf, with a Literal Translation, Notes, and Glossary* (1855); *The Anglo-Saxon Chronicle, according to the several Original Authorities* (2 vols., 1861); and *Diplomatarium Anglicum Ævi Saxonici: a Collection of English Charters* from 605 to 1066 (1865).

THORPE, FRANCIS NEWTON (1857—). An American lawyer and historian, born at Swampscott, Mass. He was educated at Syracuse University and at the Law School of the University of Pennsylvania. From 1885 until 1898 he was fellow professor of American constitutional history at the University of Pennsylvania. He published several careful and scholarly works on subjects of American history, including: *The Government of the People of the United States* (1889); *The Story of the Constitution* (1891); *The Constitution of the United States, with Bibliography* (1894); *A Constitutional History of the American People, 1776-1850* (2 vols., 1898); *A History of the United States for Junior Classes* (1900); *The Constitutional History of the United States, 1765-1895* (3 vols., 1901); and *A History of the American People* (1901).

THORWALDSEN, tŏr′vȧld-zen (Dan., THORVALDSEN), BERTEL (1770-1844). An eminent Danish sculptor, the chief exponent in the nineteenth century of antique tendency in the plastic arts. He was born at Copenhagen, November 19, 1770, the son of an Icelandic carpenter and carver of figures used upon galleons. Bertel's early successful attempts at his father's craft caused the latter to send the boy to the Academy at the age of eleven. After winning several other medals, he received, in 1793, the great gold medal, and with it a stipend for three years' study at Rome. It was not, however, until 1796 that the stipend for sculpture became available and Thorwaldsen set out on his journey as passenger in a royal frigate, reaching the Eternal City in March, 1797. There he was primarily less influenced by the master works of antiquity than by Carstens, who had already been his model during his adolescence at Copenhagen. Although he worked diligently, his earnings were scant, and after his stipend had been prolonged three times he was on the point of returning home, in 1803, when a commission came to him from Sir Thomas Hope to execute in marble the colossal statue of "Jason with the Golden Fleece," the plaster cast of which had called forth the admiration of all connoisseurs and critics, and even of Canova. Orders now came to him in abundance, especially after he had finished the spirited relief of the "Abduction of Briseis," following close upon his Jason. It ranks among his most perfect creations in the realm of relief sculpture, which became his favorite medium of expression. In 1804 he produced the famous group of "Cupid and Psyche," and the relief of "Dance of the Muses on Mount Helicon," and in 1805 the statues of "Apollo," "Bacchus," and "Ganymede," which was later followed by a "Ganymede Filling the Cup," and the graceful group of "Ganymede Watering the Eagle of Zeus." With his increasing reputation came new distinctions and honors; in 1804 the Florence Academy appointed him professor and in 1808 he was elected a member of the Accademia di San Luca in Rome, sending as his reception-piece the relief "A Genio Lumen." About 1809 Thorwaldsen won a new patron in Crown Prince Louis of Bavaria, who sought his advice in purchasing antique works of art and commissioned him to execute a statue of "Adonis" (completed in 1832, Glyptothek, Munich).

During the years 1809-11 he originated so many works, some of them among his best, that he felt obliged to avail himself of the coöperation of his pupils and assistants. To the year 1809 belong four of his most attractive reliefs, the group of "Hector, Paris, and Helena," and three other mythological subjects, and in 1810-11 he wrought the life-size statue of "Psyche," one of the master's creations approaching nearest to the spirit of antique art, and a heroic-sized "Mars Weighing Cupid's Arrows." About this time Napoleon had planned a visit to Rome, and the French Academy there, being charged with the decoration of the Quirinal for the conqueror's reception, intrusted Thorwaldsen with the execution of a frieze representing the "Entry of Alexander the Great into Babylon," with which he achieved prodigious success. Its execution in marble found a permanent home in the Villa Carlotta on Lake Como, and a modified replica was acquired by the Danish Government for Kristiansborg Castle. From a purely artistic point of view the "Memorial to Baroness Schubart" (1814) is nearest akin to the Greek reliefs of the fourth century B.C., and of his compositions dating from 1814-15, the medallions of "Morning" and "Night" have probably given him the widest reputation. In 1816-18 he produced "Venus with the Apple," "Hebe," "Cupid Triumphant," "Bacchante Dancing," "Shepherd Boy Resting," "Mercury Slayer of Argus," and "The Three Graces." The latter subject he treated even more successfully in the high relief for the tomb of the Milanese painter Appiani. A series of charming reliefs with Cupid as the central figure date from the same period, and the year 1819 saw the realization of the unique "Lion Monument," at Lucerne, chiseled out of the natural rock by the Swiss sculptor Ahorn after Thorwaldsen's model.

Arriving at Copenhagen in October of the same year, he was fêted and overwhelmed with honors, and besides works of less importance he obtained a commission for the plastic decoration of Vor Fruekirke (Church of Our Lady), with figures, groups, and reliefs, executed subsequently in Rome. They comprise the colossal statue of "Christus Consolator," one of his masterpieces, the statues of the "Twelve Apostles," and the reliefs of the "Institution of Baptism" and of the "Institution of the Holy Communion." He left

Copenhagen in 1820 and, having arranged at Warsaw for the erection of his equestrian statue of Prince Poniatowski and the Copernicus Monument, returned to Rome, where he devoted himself zealously to his new commissions. To these were added the "Monument to Pope Pius VII." (completed and placed in Saint Peter's in 1831), and the statue of Lord Byron (completed 1835 and since 1845 in the library of Trinity College, Cambridge). A statue of "Hope," ordered in 1818 and completed 1829, adorns the tomb of the Humboldt family in the park at Tegel, near Berlin.

In 1825 Thorwaldsen was elected president of the Accademia di San Luca in Rome, notwithstanding the objections to him as a Protestant. When, in 1830, he went to Munich to superintend the erection of his statue of "Duke Eugene of Leuchtenberg," in Saint Michael's Church, he was received by King Louis with the greatest distinction and at once given the commission for an equestrian statue of the "Elector Maximilian I.," the first instance in which he represents an historical personage in the costume of the time. This was done most successfully in the statue of "Conradin, Last of the Hohenstaufen," in Santa Maria del Carmine, at Naples. Besides some reliefs of antique subjects, he produced in the thirties the figure of a "Young Dancer" (1837, Palazzo Torlonia) and a colossal statue of "Vulcan," one of his last works done in Rome.

In 1838, at the invitation of the King, he returned to his native country. The simple woodcarver's son was conducted thither like a reigning sovereign in a royal Danish frigate. Besides his monumental tasks for the Fruekirke, it was principally reliefs from Greek mythology that now claimed his attention, and in the spring of 1841 he repaired once more to Rome to finish some subjects he had left behind. His journey through Germany was a triumphal progress, and after one year in Rome he returned to Copenhagen, devoting himself to work in relief. The pieces known as "Christmas Joy in Heaven," "The Rape of Hylas," and the famous "Four Seasons" are the most remarkable. He died at the theatre, on March 24, 1844, and was escorted to his burial place with princely honors, the entire royal family attending the funeral. His native city erected to her great son a worthy monument in the Thorwaldsen Museum, in which all his works, in the original or in plaster models, his sketches and studies, and his art collections are preserved, and in the court of which his earthly remains have, according to his wish, found their last resting place.

Bibliography. For his life and works consult Andersen (Berlin, 1854); Thiele, collated from the Danish by Barnard (London, 1865); id., *Thorvaldsen and His Works*, trans. by Sinding (New York, 1869), with 365 engravings; Plon, trans. by Mrs. Cashel Hoey (London, 1874), and by Luyster (Boston, 1874); Lücke, in Dohme, *Kunst und Künstler des neunzehnten Jahrhunderts*, i. (Leipzig, 1886); Sigurd Müller (Copenhagen, 1893); and Rosenberg (Bielefeld, 1901): also Kestner, *Römische Studien* (Berlin, 1850); Springer, *Bilder aus der neueren Kunstgeschichte* (Bonn, 1867); Lübke, *Geschichte der Plastik* (Leipzig, 1880); Lange, *Sergel og Thorvaldsen* (Copenhagen, 1886); and id., *Thorwaldsens Darstellung des Menschen*, trans. by Mann (Berlin, 1894).

THOS, thōz. A tall, non-Mongoloid people of Tonking, in the valley of the Claire River, with subbrachycephalic head-form, whom some ally with the Indonesians, others with the Lolos. They are husbandmen, living in houses on piles, and wearing a very picturesque costume. The Thos and the Muongs (q.v.) of the valley of the Black River in Tongking may be regarded as one of the principal groups of the Thai stock, to which belong the Shans (q.v.), the Laotians (see Laos), and the Siamese. Consult Garcin, *Un an chez les Muongs au Tonkin* (Paris, 1891); De Lanessan, *L'Indo-Chine française* (ib., 1889); Pinabel, *Sur quelques peuples sauvages dépendant du Tong-King* (ib., 1884).

THOTH, thŏth *or* tōt (Gk. Θώθ, *Thōth*, Θωύθ, *Thōyth*, Θεύθ, *Theyth*, from Egypt. *Dhutï*). An Egyptian deity identified by the Greeks with Mercury (q.v.). See also Hermetic.

THOTHMES, thŏth′mēz *or* tōt′mĕs (Egyptian *Dhutï-mose*, son of Thoth; Gk. Τούθμωσις, *Touthmōsis*) or Tahutianes. The name of four kings of Egypt of the Eighteenth Dynasty.

Thothmes I. was the son and successor of Amenophis I. (q.v.) and ascended the throne about B.C. 1560. According to Manetho, as cited by Africanus, he reigned for 22 years, though no date higher than his ninth regal year has as yet been found upon the monuments. The first recorded military expedition of Thothmes I. was directed against the Nubians, whom he defeated, returning in triumph to Thebes with the body of their chief hanging from the bow of his ship. In his third year he found it necessary to chastise the Nubian tribes in another expedition. Not long after this he invaded Asia and, marching as far as the Euphrates, set up a stele which was later seen and mentioned by Thothmes III. The remainder of his reign seems to have been peaceful and was largely devoted to building operations. At Karnak (q.v.) he built two pylons and two hypostyle halls, and erected two obelisks, one of which (76 feet high) is still standing. (See Obelisk.) He also constructed buildings in the necropolis of Thebes, at Abydos, at Ibrim (a rock-hewn chapel), and at other places. The coffin of Thothmes I. was found in 1881 at Deir el-Bahri, but whether the mummy it contained is that of the King is not altogether certain.

Thothmes II., the son and successor of Thothmes I., reigned for at least nine years, according to the monuments, and according to Manetho for twelve or thirteen years. An inscription at Assuan, dated in the first year of his reign, states that he sent an expedition against the Nubian tribes who had raided his territory, and he seems to have fought against the Asiatic Bedouin, but he undertook no extensive wars. He made additions to the great Temple of Ammon at Karnak, and his name is inscribed upon buildings in many parts of Egypt. The mummy of the King, found in 1881 at Deir el-Bahri, is that of a young man, apparently not over thirty years of age. His sister and wife, the able and energetic Hatshepset (see Hatasu), was coregent with him throughout his reign, and was the real ruler of the kingdom.

Thothmes III. was one of the greatest of all the Egyptian monarchs. The evidence as to his parentage is not altogether clear, but in all probability he was the son of Thothmes II. by a wife named Iset, and the nephew of the great Queen Hatshepset (Hatasu). He was a mere child when he succeeded his father about B.C. 1538, and he reigned for nearly 54 years. For more than 21 years he was coregent with his aunt Hatshepset, who seems to have allowed him merely a nominal share in the government. As soon as her death left him sole ruler (about B.C. 1516) he entered upon a career of conquest unrivaled in the annals of Egyptian history. Assembling an army for the invasion of Syria, he celebrated the twenty-third anniversary of his accession at Gaza. Marching thence through the passes of Mount Carmel, he signally defeated the allied Syrian forces on the plain of Esdraelon and forced them to take refuge in the city of Megiddo, which capitulated after a brief siege. The captive Syrian chiefs were restored to their dignities as vassals of Egypt, and Thothmes, after receiving messages of congratulation from a number of foreign princes, among them the King of Assyria, returned home laden with booty. The conquest was, however, not yet complete. Some of the Syrian and Phœnician cities offered a stubborn resistance and there were frequent revolts, the opponents of Egypt being encouraged and supported by the powerful State of Mitanni (see AMARNA LETTERS), which at that time occupied Northern Syria and Northern Mesopotamia. A war with this State soon followed, in the course of which Thothmes ravaged the Mitannian territory and captured a number of cities, including the important city of Carchemish, on the Euphrates. He gained no permanent possessions in this quarter, but the result of the war enabled him to extend his dominions, undisturbed by Mitannian interference, over Northern Palestine and Phœnicia. At the city of Ni, near the Lower Orontes, he set up a stele to mark the limit of the Egyptian Empire in that quarter. In the course of his reign Thothmes conducted at least fourteen Asiatic campaigns, and the large booty and tribute he obtained were lavished freely upon the Egyptian temples. In the 50th year of his reign he caused the old canal at the first cataract of the Nile to be cleared and sailed through it on an expedition against the Nubians. As a builder Thothmes was hardly less energetic than as a warrior, and his monuments occur throughout Egypt and Nubia. He made important additions to the great Temple of Ammon at Karnak and caused the annals of his reign to be inscribed upon its walls, and he also built at Heliopolis, Memphis, Abydos, Hermonthis, Edfu, Esneh, Ombos, and other places. In Nubia, where he built or restored many temples, he was the founder of the large temple at Soleb, near the third cataract. Of the numerous obelisks erected by him, one is now on the hill of the Lateran at Rome; another is in Constantinople; a third stands on the Thames embankment in London; and a fourth is in Central Park, New York. (See OBELISK.) Thothmes III. died about B.C. 1485; his mummy was among those found at Deir el-Bahri in 1881.

THOTHMES IV., the son of Amenophis II. (q.v.) and the grandson of Thothmes III., ruled for nine years from about B.C. 1460. He conducted military expeditions to Nubia and to Phœnicia, collecting booty and tribute in both countries, and an inscription at Ghizeh records that he cleared away the sand from the great Sphinx (q.v.). From the Amarna tablets it appears that he maintained friendly relations with Babylonia and with Mitanni, and that he married the daughter of Antatama, King of the latter country.

Consult: Wiedemann, *Aegyptische Geschichte* (Gotha, 1884-88); Meyer, *Geschichte des alten Aegyptens* (Berlin, 1887); Petrie, *A History of Egypt* (New York, 1897); Budge, *A History of Egypt* (ib., 1902); Müler, *Die alten Aegypter als Krieger und Eroberer in Asien* (Leipzig, 1903).

THOU, tōō, JACQUES AUGUSTE DE (1553-1617). A French historian, born in Paris October 8, 1553. He studied jurisprudence at Orleans and Valence and in 1576 became an ecclesiastical councilor of the Parlement of Paris. He was an active member of the *Politiques* (q.v.), who were largely instrumental in establishing on the throne Henry of Navarre, by whom De Thou was made keeper of the royal library and vice-president of the Parlement. In 1591 he began his great work, the *Historia Sui Temporis*, which covered the period from the death of Francis I. to that of Henry IV. (1547-1610), and which occupied him during the remainder of his life. He took an important part in the drawing up of the Edict of Nantes. The history was completed by Rigault from materials left by De Thou and comprises in its full form 143 books. The work is marked by striking fairness and a faithful adherence to fact, remarkable in a history dealing with a period of bitter partisan spirit, civil war, and anarchy. The history was published in 11 volumes (Paris, 1609-14) and 4 volumes (Frankfort, 1625), both in Latin. A French translation appeared in 10 volumes (Paris, 1740), and one in English by Buckley in 7 volumes (London, 1773). After De Thou's death appeared his memoirs, *Thuani Commentarii de Vita Sua* (Orleans, 1620). Consult: Collinson, *Life of Thuanus, with some account of his writings* (London, 1807); Chasles, *Discours sur la vie et les ouvrages de J. A. De Thou* (Paris, 1824).

THOUGHT. See CONCEPT; IMAGINATION; INFERENCE; JUDGMENT; LANGUAGE; LOGIC; MEMORY; RATIOCINATION.

THOUSAND AND ONE DAYS. An imitation of the *Thousand Nights and One Night*, or *Arabian Nights* (q.v.), written by Pétis de la Croix, a French Orientalist and traveler, in 1710. The work purports to be a translation of a Persian collection called *Hazar u yak rūz*, which Mukhlis, a Persian friend of De la Croix, alleged he had made from a Turkish book *Al-Faraj ba'd ash-Shiddah*, or *Joy After Sorrow*. So far as is known, however, the *Hazar u yak rūz* does not exist, although the Turkish work is extant, and is well known to scholars. The first edition of the *Thousand and One Days* was made by De la Croix (Paris, 1710-12).

THOUSAND AND ONE NIGHTS. See ARABIAN NIGHTS.

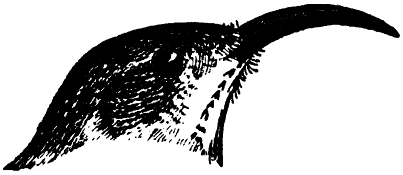
THOUSAND ISLANDS, THE. A collection of small islands, numbering about 1700, situated in an expansion of the Saint Lawrence River, about 40 miles long and from 4 to 7 miles wide, between Ontario, Canada, and Jefferson and Saint Lawrence counties, New York (Map: Ontario, G 3). They are favorite resorts for summer tourists on account of their picturesque beauty. Many are private property and contain the summer homes of wealthy Americans and Canadians.

THRACE, thrās (Lat. *Thracia*, from Gk. **Θρᾴκη**, *Thrakē*, Thrace, from **Θρᾷξ**, *Thrax*, Thracian). The ancient name of an extensive region in the eastern part of the Balkan Peninsula, whose boundaries varied at different periods. At first the designation seems to have included part of Macedonia, where early story knows of Thracians in Pieria, with whom was connected the worship of the Muses, mythical bards, and Dionysus. In later times, however, the name was applied to the great district northeast of Macedonia bounded on the north by the Danube, on the east by the Euxine, on the south by the Bosporus, Propontis (Sea of Marmora), Hellespont, the Ægean, and Macedonia, and on the west by Illyria and Macedonia. Under the Romans it designated the region south of the Hæmus Mountains (Balkans), the region to the north being the Province of Mœsia. From the Hæmus three lesser chains stretch toward the south. The three most important rivers of Thrace were the Strymon (mod. *Struma*), which during the Greek period formed the boundary between Thrace and Macedonia; the Nestus (mod. *Kara-Su*); and the Hebrus (mod. *Maritza*, q.v.), the largest—all of which flow southward into the Ægean Sea. The climate was considered by the Greeks very severe—even that of Ænos, on the shores of the Ægean, being described by Athenæus as "eight months of cold and four months of winter." The country was in great measure uncultivated, and covered with forests, but the river valleys were fertile. The chief products were corn, millet, wine, and hemp. Cattle, sheep, horses, and swine were raised in great numbers. The minerals were a great source of wealth, especially the rich gold mines of Mount Pangæus, which attracted the Thasians, and led the Athenians to the foundation of Amphipolis.

While the exact relation between Thracians and Greeks is still uncertain, it is clear that the former belonged to the great Indo-European family, and were probably closely akin to the Phrygians of Asia Minor, whose language indicates a somewhat near connection in the past with the Hellenic race. In historic times the Thracians appear as a wild and barbarous race, fond of war and plunder, and ruled over by many petty kings. In the sixth century B.C. they were subdued by the Persians, but after the retreat of Xerxes resumed their independence, of which they had probably been only nominally deprived by their conquerors. In the fifth century a king, Teres, seems to have secured a decided supremacy and under his rule and that of his son Sitalces, with whom the Athenians contracted an alliance, it is possible to speak of a Thracian kingdom. After the death of Sitalces his territory was divided into three parts, and the old internecine strife was resumed. Thrace thus fell an easy prey to Philip of Macedon (after B.C. 359), who incorporated the western portion of the country, as far as the Nestus in Macedonia, while Macedonian garrisons held the rest of the country in subjection. After the fall of Macedon before the power of Rome (B.C. 168) Thrace was for a short time independent, but in B.C. 133 came under the Roman rule. Mœsia was formed into a province in B.C. 29, but Thrace continued under dependent kings until A.D. 46, when it was organized as a province. After the division of the Roman Empire (395) it shared the history of the Eastern Empire. The natural resources of the country and the opportunities for profitable trade led to the establishment of Greek colonies along the coast at an early period. The earliest were naturally along the waters leading to the Black Sea, among them Byzantium, Selymbria, Perinthus, Sestus, and Elæus, while before the end of the sixth century B.C. Miltiades had secured the Thracian Chersonese (the modern Peninsula of Gallipoli) for Athens. Along the Ægean coast were Amphipolis, Abdera, Mesembria, Ænus, and many others, while on the Black Sea were Istrus, Tomi, Odessus, and Apollonia. These colonies, however, never attempted to control the interior, and though they submitted to the Persians, and later to the Macedonians and Romans, their history belongs to Greece rather than to Thrace. In A.D. 334 a colony of Sarmatians was planted in Thrace by Constantine, and in 376 another of Goths by permission of Valens. In 395 it was overrun by Alaric, and in 447 by Attila. Soon after the middle of the fourteenth century Sultan Amurath I. obtained possession of all its fortresses, except Constantinople, and it has ever since remained subject to Turkey. Consult: Hiller von Gaertringen, *De Græcorum Fabulis ad Thraces Pertinentibus* (Göttingen, 1886); Kalopathakes, *De Thracia, Provincia Romana* (Berlin, 1894); Tomaschek, *Die alten Thraker* (Vienna, 1893-95). See BALKAN PENINSULA; BULGARIA.

THRALE, HESTER LYNCH. An English author. See PIOZZI.

THRASHER (variant of *thrusher*, from thrush). A name given in the United States to the various species of thrush-like wrens of the genus Harporhynchus. They have generally a rather long decurved bill, not notched near the tip; short concave wings, much shorter than the tail. In color they are brown or ash above, usually spotted on the breast. Their names are brown thrasher (*Harporhynchus rufus*); Cape Saint Lucas thrasher (*Harporhynchus cinereus*); gray curvebill thrasher (*Harporhynchus curvirostris*); California thrasher (*Harporhynchus redivivus*); crissal thrasher (*Harporhynchus crissalis*); and Arizona thrasher (*Harporhynchus Bendirii*); besides which there are several subspecies. Only the brown thrasher is widely distributed; all the others are confined to the South-western United States, especially Arizona and Mexico. The brown thrasher, often improperly called 'brown thrush,' is common in the Eastern United States, ranging north to Canada and west



HEAD OF CRISSAL THRASHER.

to the Rockies. It is migratory in the North, but winters in the Southern States. It is about a foot long, rich ferruginous above, creamy, spotted with brown beneath. It is one of the finest songsters native to America and is also a very fine mimic, thus resembling the mocking bird, to which it is nearly related. Its nest is placed in a low bush or on a brush heap, and the eggs are profusely peppered with brown specks. See Plate of Eggs of American Song Birds. Consult Coues, *Birds of the Colorado Valley* (Washington, 1878).

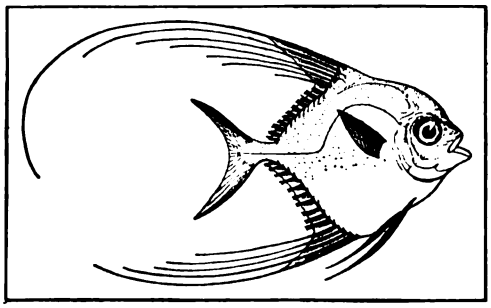
BROWN THRASHER.

THRAS'YBU'LUS (Lat., from Gk. *θρασύβουλος*, *Thrasyboulos* (?-B.C. 390). An Athenian general and a prominent member of the democratic party at Athens during the last years of the Peloponnesian War. In company with Thrasyllus at Samos, in B.C. 411, he vigorously opposed the establishment of the Four Hundred, and was instrumental in securing the recall of Alcibiades from exile. In the same year he, with Thrasyllus, defeated the Peloponnesian admiral Mindarus at Cynossema, and in B.C. 407, in command of a fleet of thirty vessels, he compelled the submission of the revolted cities in Thrace. He held a subordinate command in the battle of Arginusæ (B.C. 406), and afterwards concurred with Theramenes in the accusation of the generals therein engaged. Being banished by the Thirty Tyrants (B.C. 404), he went to reside at Thebes, where he planned the overthrow of the Thirty and the reëstablishment of the democracy. With a hundred men, refugees like himself, he seized the deserted fort of Rhyle, and, being here joined by others, advanced on the Piræus itself. In the battle that ensued the Thirty were worsted, and, as a result, the democratic form of government was soon reëstablished at Athens. In B.C. 395 Thrasybulus commanded a force sent to assist Thebes against the Spartans. In B.C. 391 he was dispatched, in command of forty triremes, to the assistance of Rhodes, but, first sailing to the Hellespont, succeeded in extending the alliances of Athens in those regions. When his fleet reached Pamphylia he was slain by night in his tent by the people of Aspendus, in consequence of some misdeeds committed by his soldiers.

THRASYL'LUS (Lat., from Gk. *θράσυλλος*), Monument of. A choragic monument at Athens erected in B.C. 320, by Thrasyllus, in a cave above the Theatre of Dionysus. An ornamental architectural front closed the cave and was surmounted by a statue of Dionysus, now in the British museum. The monument is almost entirely destroyed with the exception of an inscribed architrave, and two columns designed for votive tripods, on the face of the rock above the cave.

THREAD. An exceedingly small twine made by twisting several thicknesses of yarn so as to produce a strong and well-rounded line for sewing with, either of cotton, flax, or silk.

THREADFISH, Cobbler-Fish, or Sunfish. A well-known fish (*Alectis ciliaris*) allied to the pompanos, of both coasts of tropical America, where it has some commercial importance. It is of moderate size, has the curious shape shown in the illustration, and owes its names to the long filaments (becoming shorter with age) into which the first few rays of the dorsal and anal fins are prolonged.



THREADFISH.

THREAD-HERRING, or Machuelo. A small fish (*Opisthonema oglinum*), closely related to sardines and menhaden, common along the Southern coast; it is 12 inches long, bluish above and silvery below, with an indistinct bluish shoulder-spot, and has a long dorsal fin-filament, from which the fish receives its name.

THREADNEEDLE STREET. A London street, on which stands the Bank of England, hence popularly called the "Old Lady of Threadneedle Street." The origin of the name is said to be the three needles as the escutcheon of the Needlemakers' Company.

THREAD-WORMS. The thread or roundworms are members of the class Nematelminthes, order Nematoidea, and are so called from their slender round thread-like body. The dense skin is not segmented, and the body-cavity (cœlome) is not lined with epithelium, but is directly bounded by the muscles of the body. There is a definite digestive canal. Two excretory canals open in front on the ventral side of the body, while the nervous system consists of a ring around the pharynx, from which two main nerve cords pass backward. The true thread-worms undergo no metamorphosis. They are mostly parasitic and usually bisexual. Some of them are free, living coiled up under stones between tide-marks; certain minute species occur in fresh water or damp earth or mud. A few live in plants, and *Tylencha tritici* damages wheat.

The more common parasitic forms are species of Ascaris, Trichina, Oxyuris, etc. Of Ascaris, the human roundworm (*Ascaris lumbricoides*) is remarkable for its great size, being 5–6 inches long, and about a tenth of an inch in diameter; it has three papillæ around the mouth and is milk-white. The common pin-worm (*Oxyuris vermicularis*) lives in the rectum of children; the palisade-worm (*Eustrongylus gigas*), one female of which was 39 inches in length and the thickness of a quill, the male being one-third as long, has been found living in man; allied species occur in the brain or brain-cavity of birds. Among the most formidable human parasites of this group are the Trichina (q.v.), the guinea-worm (q.v.), and the species of Filaria. *Filaria sanguinis-hominis*, a microscopic thread-worm found living in the blood of the mosquito in India and China, is thought to occasion the disease known as elephantiasis. The formidable disease called *beri-beri* is supposed to be due to a nematode worm, whose eggs and embryos swarm by millions in the soil and dirty puddles around the villages. In certain species of the family Anguillulidæ there is an alternation of generations (see Parthenogenesis), from an hermaphroditic internal parasitic to a free diœcious generation. Thus *Rhabditis* (*Rhabdonema*) *nigrovenosa* lives in mud, and gives rise to a second form living in the lungs of frogs.

THREATS. See such titles as Blackmail; False Imprisonment; Conspiracy; Intimidation; and consult the authorities referred to under Criminal Law and Conspiracy.

THREE CHAPTER CONTROVERSY. See Chapters, The Three.

THREE CHOIRS FESTIVAL. An English musical festival which had its first regular organization in 1724, when the three cathedral choirs of Gloucester, Worcester, and Hereford joined for the performance of a cathedral service, and an oratorio performance given in the Shire Hall. The proceeds have always been devoted to a fund for the relief of the widows and orphans of the poorer clergy of the three dioceses. In 1753 the festival was extended to three days, and in 1836 to four days, the period which still prevails. The festivals are held alternately in each of the three cities, and the conductor is always the organist of the cathedral of the city in which the festival is held.

THREE-COLOR PROCESS. A photo-mechanical process of reproducing in color applicable either to stone or metal. The general process consists in first making three photograph negatives of the same subject through three different color screens representing the three primary colors, red, yellow, and blue. From these three negatives printing blocks are made and the result is obtained by making three printings, one from each block, with three different pigments, each pigment representing as nearly as possible the color originally used in the color screen. The accuracy of the finished picture depends, therefore, to a great extent, upon the correctness of the pigments selected. The process is largely mechanical and the result is only approximately correct, though increased care is being taken in the manipulation and better results are constantly obtained. The Colored Plate shown in the article on Lithography (q.v.) was prepared in this manner. Reference should also be made to the article Color Photography, where the underlying principles are explained. The method of making the metal 'half-tone' plates is discussed under Photo-Engraving.

THREE KINGS OF COLOGNE. The three wise men of the East or Magi who followed the star to the birthplace of the infant Jesus. Their names are usually given as Gaspar, Melchior, and Balthazar. Their bones are supposed to be preserved in Cologne Cathedral.

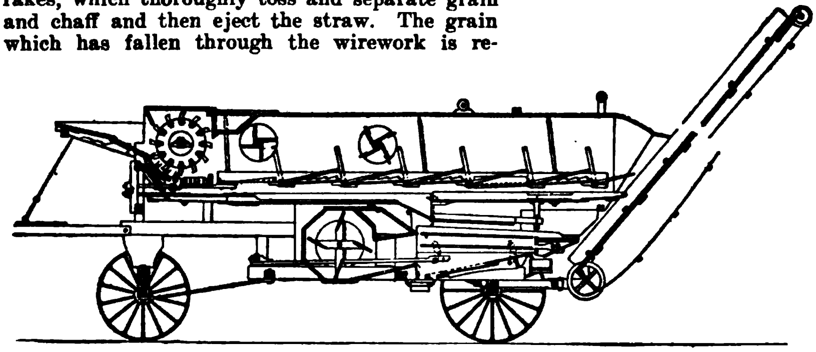
THREE MUSKETEERS. See Trois Mousquetaires.

THREE RIVERS. A port of entry and the capital of Saint Maurice County, Quebec, Canada, at the junction of the Saint Lawrence and Saint Maurice rivers, and on the Grand Trunk and the Canadian Pacific railroads, midway between Montreal and Quebec (Map: Quebec, D 4). It was founded in 1634 by Champlain, and is within a short distance from the famous falls of Shawanegan. It has a cathedral, a college, saw mills, iron foundries, machine shops, and a shoe factory, and the water power of the falls has been utilized for the manufacture of wood pulp. Here on June 8, 1776, an American force of about 2000 men under General Thompson attacked a British force of about 6000 men, and was disastrously defeated, both General Thompson and Colonel Irvine, his second in command, being captured. Population, in 1891, 8334; in 1901, 9981.

THRESHER-SHARK, or Swingletail. An extraordinary shark (*Alopias vulpes*) abounding in all warm seas, especially in the Mediterranean and the Atlantic, and distinguished by its long tail. (See Plate of Great Sharks under Shark.) This is an extension of the upper lobe of the heterocercal tail to a length equal or exceeding that of the body, and is used in obtaining the food. This shark follows the herring, menhaden, and other gregarious fishes in their migrations, and, rushing into their schools, threshes about with its tail, killing or stunning many. It is reported to attack whales, but there is no scientific evidence of this. It is about 15 feet long, lead color above, and whitish beneath, and contains some oil, but not enough to compensate for the trouble its capture causes.

THRESHING (from *thresh*, AS. *þerscan*, *þærscan*, Goth. *þriskan*, OHG. *drescan*, Ger. *dreschen*, to thresh; connected with Lith. *traszkéti*, to rattle, OChurch Slav. *thryeshtiti*, to strike) and Threshing Machines. Threshing is the separating of the grain or seeds of plants from the straw or haulm, a process which has been accomplished in various ages and countries by sundry means more or less effective. The first method known to have been practiced was the beating out of the grain from the ears with a stick. An improvement on this method was the practice of the ancient Egyptians and Israelites of spreading out the loosened sheaves of grain on a circular piece of hard ground and driving oxen over it, so as to tread the grain out; but as this mode was found to damage a portion of the grain, it was partially superseded in later times by the threshing-sledge, a heavy frame mounted on three rollers, which was dragged over the heaps of sheaves. The method of treading out the grain or seed, however, is still used to a limited extent on small farms in the United States, especially in case of buckwheat, clover, beans, etc. Similar methods of threshing were employed by the Greeks and Romans, the stick (*fustis*, *baculum*, *pertica*), the treading by men or horses, and the threshing-sledge (*tribulum*) being found in common use among them; but their threshing-sledge, which is still to be seen in operation in Greece, Asia Minor, Georgia, and Syria, differed from the Eastern one by having pieces of iron or sharp flints fastened to the lower side, in place of rollers. The primitive implement in Northern Europe was the stick, and an improved modification of it, the flail, is still used to a limited extent in Europe and America. The flail consists of two sticks loosely fastened together at one end by stout thongs; one stick is used as a handle by the workman, and by a circular swing around his head he brings down the other stick horizontally on the heads of the loosened sheaves spread out on the barn-floor.

Early but unsuccessful inventions to supersede the flail by a machine, both in England and America, were largely of the rotary beater or flail type. In 1786, however, Andrew Meikle, an ingenious Scotch mechanic, produced a threshing machine so perfect that, despite nearly a century of improvers, it is essentially the machine of its inventor. In Meikle's machine the mode of operation is as follows: A sheaf is loosened and spread out on the feeding-board, with the ears toward the machine; it is then pushed forward till caught between two revolving fluted rollers of cast iron, a new sheaf taking its place as soon as the first has disappeared. Behind the rollers is a rapidly revolving drum or cylinder, having four beaters or spars of wood armed with iron placed along its surface parallel to its axle; and these beaters, striking the heads as they are protruded from between the rollers, detach the seeds and husks. Grain and straw then pass together over the cylinder, the grain falling through wirework, the straw being passed forward by circular rakes, which thoroughly toss and separate grain and chaff and then eject the straw. The grain which has fallen through the wirework is received into a winnowing machine, where the chaff is blown out, etc., and is then either discharged or, as in the most improved machines, is raised by a series of buckets fixed on an endless web, and again winnowed, to separate the perfect grains from the light and small seeds. Previous to the second winnowing, barley is subjected to the process of hummeling, by which the awns are removed.



LONGITUDINAL SECTION OF MODERN THRESHER.

Modifications of Meikle's drum in which the two grooved cylinders were dispensed with were employed to some extent in threshing machines in England and America, but have been almost entirely superseded in modern machines by a high-speed cylinder with radial teeth playing between inwardly projecting teeth set in a fixed concave or section of a cylinder. Prior to 1840 little progress was made in perfecting the threshing machine in America. Since that date improvement has been rapid, and the modern American machine with a capacity of 1000 bushels per day is a marvel of ingenuity and efficiency. In its most advanced form it cuts the bands of the sheaves and feeds itself; thoroughly separates the grain from the straw, winnows the grain and deposits it in sacks or loads it into wagons; removes the straw and stacks it. The figure shows the interior construction of a modern thresher. The concave is open and has in rear an open grate so that the larger part of the grain is separated from the straw at this point and is conveyed directly to the fan. A considerable portion, however, still remains in the straw and can be separated only by further agitation, which is secured by the vibrating separator, revolving pickers or beaters, and shaking forks shown in the centre of the machine to the rear of the cylinder. These devices beat the straw thoroughly, at the same time conveying it to the rear of the machine, where it is taken by the stacker, which consists either of an elevator or tube with blast. The separated grain drops through the perforated bottom of the separator and with the grain coming directly from the drum is carried to the fanning mill by means of a vibrating platform or conveyor located immediately beneath the separator. The parts of the modern thresher are in large measure adjustable, so that the machine may be adapted to different kinds of grain and to a variety of conditions, but separate machines for special purposes are also made, as, for instance, for threshing rice, peas and beans, peanuts, clover, and for husking maize and shredding the fodder. Inventive genius is also being largely exercised in devising ingenious accessories to the thresher proper, such as automatic band cutters and feeders, stackers, and grain measurers and loaders. The motive power most commonly used for driving threshing machines is horse power or steam. The former was most common in the earlier days of the threshing machine, but has been largely superseded by the portable steam-engine. Engines with straw-burning furnaces have been used in Hungary and in the rice regions of the United States.

THRIFT (Icel. *þrift*, from *þrifa*, to thrive, clutch, grip; so called from the rapid growth of the plant), *Armeria*. A genus of plants of the natural order Plumbaginaceæ, having the flowers collected into a rounded head, a funnel-shaped dry and membranous calyx, five petals united at the base, five distinct styles, and five stamens attached to the base of the petals. By many botanists it has been regarded as a subdivision of the genus Statice, from which it is distinguished chiefly by having the flowers in heads. The common thrift (*Armeria maritima*) is a European seacoast plant which grows in turf-like form, with linear leaves, scapes a few inches high, and beautiful rose-colored flowers in midsummer. Being hardy and easily cultivated, it is often planted in gardens as a border, but it must be renewed every two or three years, the smallest rootless sets growing, however, with great readiness in the moist weather of spring. A number of other species, for instance, *Armeria elongata*, *Armeria plantaginea*, are planted as ornamentals.

THRIPS (Lat., from Gk. θρίψ, wood-worm). Any one of the minute insects of the order Thysanoptera. They are slender insects with four wings, which are also very slender and short, perfectly transparent, and without veins. They are fringed with long, delicate hairs, and when at rest lie along the back of the abdomen. The metamorphosis is incomplete, and the mouth-parts function in sucking, but are intermediate between true biting and true sucking mouth-parts. The feet bear each a little bladder-like vesicle at the tip, from which an old name of the order (Physapoda) was derived. Thrips are found in flowers, and do some damage to the essential organs. They also occur upon the leaves of plants, and one species damages onions (see ONION INSECTS) and tobacco. Another species (*Limothrips poaphagus*) works in the joints of timothy grass, causing the heads prematurely to turn yellow and die. Some species have been observed feeding upon other insects and others undoubtedly have some beneficial effect as fertilizers of flowers. Parthenogenesis sometimes occurs with these insects. Rather more than thirty species occur in the United States. The name 'thrips' has been erroneously applied by vine-growers to some of the leaf-hoppers of the family Jassidæ. Consult Hinds, *Contribution to a Monograph of the Insects of the Order Thysanoptera Inhabiting North America* (Washington, 1902).

THROAT (AS. *þrotu*, OHG. *drozza*, Ger. *Drossel*, throat; connected with MHG. *strozze*, throat, Ger. *strotzen*, to swell, Eng. *strut*), AFFECTIONS OF THE. The throat includes those structures lying behind and below the anterior pillars of the fauces. In the common acceptation of the term it also means the anterior portion of the neck, containing the windpipe, gullet, and a number of large blood-vessels and nerves. The throat may be divided anatomically into the pharynx and the larynx, the latter being the upper part of the windpipe and the principal organ of the voice. Into the pharynx open the nasal passages and the Eustachian tubes. The entrance to the pharynx is nearly surrounded by a ring of lymphoid tissue, comprising the faucial, lingual, and pharyngeal tonsils. The first of these are usually known as the tonsils, are always present, and often enlarged, and are situated at the sides of the fauces between the anterior and posterior pillars. The lingual tonsil, when it exists, lies between the base of the tongue and the epiglottis. The pharyngeal tonsils, more often referred to as adenoid growths, spring from the roof and sides of the pharyngeal vault. They are often present in children and when in any amount constitute a pathological condition, giving rise to obstructed nasal breathing, nasal catarrh, and general poor health. Any or all of these structures may be involved in diseases of the throat, and expert examination of them is often necessary. Inspection is usually conducted by light reflected into the throat from a head mirror, a circular, concave reflector pierced with a hole for vision. The light is projected through the open mouth upon the back of the throat. From this point the rays of light may be reflected by means of a small mirror introduced into the pharynx either downward to examine the larynx (laryngoscopy) or upward to inspect the posterior nares and the vault of the pharynx (rhinoscopy), the tongue being meanwhile held out or depressed. In direct examination the tonsils, soft palate, uvula, posterior wall of the pharynx, and often the top of the epiglottis may be seen. Laryngoscopy shows the whole of the epiglottis, the root of the tongue, lingual tonsil, the true and false vocal cords, the opening of the glottis, and even the bifurcation of the trachea. The throat is lined with mucous membrane, plentifully supplied with blood-vessels, glands, and nerves, and is often the seat of acute or chronic catarrhal inflammation. Acute inflammation of either the pharynx or larynx is due to exposure, sudden change of temperature, the inhalation of dust, steam, or irritating vapors, indigestion and constipation, and certain diseases such as rheumatism, gout, and tuberculosis. Chronic catarrh arises also from the causes named when long continued, and may be due to excessive use or straining of the voice. Specific inflammations of the throat accompanying scarlatina and diphtheria are described under these titles. Catarrhal inflammation of the throat is marked by a sense of dryness, or of a foreign body in the pharynx, a slight but annoying cough, and the expectoration of viscid, tenacious mucus, sometimes tinged with blood. The voice is hoarse, easily fatigued, or entirely absent. In the treatment of catarrrhal conditions in this region, alkaline and antiseptic douches are given to remove the mucous accumulations, and stimulating and astringent applications, such as tannin, iron, and nitrate of silver, used to reduce congestion and restore the membrane to its normal action. Naso-pharyngeal catarrh is frequently caused by intra-nasal abnormalities and may as often be remedied by restoring natural respiration through the nose. General tonic treatment is always necessary. Internally iron, quinine, and strychnine are the best remedies.

Abscesses sometimes occur in the throat either in the region of the tonsils (see QUINSY) or at the base of the tongue. An acute and alarming inflammation of the loose tissues about the larynx is found in connection with abscess, acute laryngitis, the injecting of scalding fluids or irritant poisons, and as a complication of certain diseases such as smallpox, scarlatina, or Bright's disease. In this condition, known as œdema of the glottis, the swollen and dropsical tissues fill up or overlap the opening of the glottis, preventing the ingress of air and threatening immediate suffocation. If not speedily relieved, œdema of the glottis causes death by asphyxiation. This affection is treated by puncture or scarification of the dropsical sac, the application of leeches over the sides of the larynx, and the administration of pilocarpine. Sometimes intubation, laryngotomy, or tracheotomy may be necessary. Intubation consists in the introduction of a metal or hard-rubber tube between the vocal cords, with a flange resting above them to prevent slipping into the trachea. Laryngotomy or tracheotomy is employed when

REPRESENTATIVE SONG BIRDS

intubation is not feasible. The former consists in opening the larynx from the outside through the cricothyroid membrane, and introducing a tube through which the patient breathes. In tracheotomy the opening is made lower down, in the trachea.

Tuberculous laryngitis occurs in many phthisical patients. There is swelling, ulceration, and destruction of the vocal cords and adjacent structures, with hoarseness, loss of voice, great pain, and inability to swallow solid food.

Syphilis, particularly in its tertiary stage, often attacks the throat, producing fibrous tissue which gradually contracts, and narrows, distorts, and partially destroys the larynx.

Foreign bodies not seldom find their way into the larynx, and if small are apt to pass into the trachea or bronchial tubes, and if not removed may produce death by suffocation or set up a fatal pneumonia. In children it is often possible by inverting and shaking the patient to dislodge a foreign body; in other cases these have to be removed by specially devised instruments or a cutting operation.

Cancer and other tumors of a polypoid or fibrous character may develop in the larynx or its neighborhood. Cancer is nearly always fatal. See CATARRH; DIPHTHERIA; QUINSY; TONSIL.

THROMBOSIS (Neo-Lat., from Gk. *θρόμβωσις*, the state of being curdled, from *θρόμβος*, *thrombos*, curd, clot). A term originally suggested by Virchow, and employed to designate an affection of the blood vessels (either veins or arteries) which essentially consists in a coagulation of blood (forming a true clot) at a certain fixed spot, owing to disease of the blood vessel, pressure against its side or laceration of it, or microbial infection. It is a common cause of sudden death in persons who appear to be in robust health. If death does not result, after the detachment of a thrombus and its lodgment, as an embolism, in a cerebral artery, softening of the brain follows. See APOPLEXY; EMBOLISM.

THROMBUS. A stratified clot formed within a blood vessel by coagulation at a bifurcation of a vessel or upon a surface roughened, for example, by sclerotic changes. See THROMBOSIS.

THROOP, MONTGOMERY HUNT (1827-92). An American lawyer, nephew of Enos T. Throop, late Governor of New York. He was born in New York State, and, after studying at Hobart College, practiced law in partnership with Roscoe Conkling. In 1870 he was appointed a commissioner to revise the statutes of the State; afterwards was chairman of the commission that prepared the Code of Civil Procedure, and after 1878 devoted himself to legal writing. His publications include a *Treatise on the Validity of Verbal Agreements* (1870); an *Annotated Code of Civil Procedure* (1880); and the *Revised Statutes of New York* (1888).

THROSTLE. See SPINNING.

THROW (AS. *þrāwan*, OHG. *drāhan*, *drājan*, Ger. *drehen*, to turn, twist; connected with Lat. *terebra*, borer, Gk. *τερεῖν*, *terein*, to bore). The term applied in mining to the amount of dislocation (q.v.), in a vertical direction, produced by a fault in the strata. That side of the fracture which has moved downward relatively is spoken of as the downthrow side, the opposite one as the upthrow. See FAULT.

THRUSH (AS. *þrysce*, OHG. *drōsca*, *drōscea*, *drōscela*, Bavarian *Droschel*, thrush; connected with AS. *þrostle*, *þrosle*, Eng. *throstle*, Ger. *Drossel*, thrush, and ultimately with Lat. *turdus*, Lith. *strázdas*, Lett. *strazds*, thrush). The thrushes comprise the subfamily Turdinæ of the family Turdidæ, usually ranked as the highest group of birds. They have a bill of moderate size, straight, shorter than the head, and provided at the base with rictal bristles; the nostrils are oval and bare; the tarsi are long, slender, and 'booted;' ten primaries are present, but the outermost is exceedingly small; tail shorter than wings. About 150 species, all of moderate size, are known, and they are widely distributed, and most of them are migratory. A few species are gregarious, but the majority live singly or in pairs. Their food is mainly insects and worms, of which they destroy incalculable numbers, but in winter they eat berries and seeds, and in spring small fruits. All are excellent singers, and some are counted the best of bird songsters.

In America, north of Mexico, there are about a dozen species of thrush, of which the best known is the common robin (q.v.), which ranges over the whole continent. In Lower California there is an allied species; and in the Northwest occurs the 'varied thrush.' (See OREGON ROBIN.) Our more distinctive 'thrushes' are considerably smaller than the robin, and all of them are birds of the woods.

The best known are the Wilson's thrush or veery (*Turdus fuscescens*), the song or wood thrush (*Turdus mustelinus*), the olive-backed thrush (*Turdus ustulatus*), and the hermit thrush (*Turdus Aonalaschkæ*), the two latter having several 'varieties.' All these are seven or eight inches long, olive or brown above, white, more or less creamy and spotted below. The wood-thrush or 'wood-robin' is a less retiring bird, not infrequently seen on lawns and in orchards. He is larger than the veery, with the head bright cinnamon brown, changing gradually into light olive brown toward the tail. Moreover, he is thickly marked with large round black spots underneath. The song of this thrush, especially as evening approaches, is remarkably sweet and has made him a great favorite with bird-lovers. The ordinary calling note has been likened to striking pebbles together; it is utterly unlike the clear whistle of the veery. The nest is usually in a bush or on a tree-limb or a stump, five or ten feet from the ground, and is distinctively characterized by always having a foundation of dead leaves, often with some mud. The eggs are clear blue. The olive-backed thrush is a more northerly species than either of the preceding, and occurs in the United States chiefly as a migrant, while it winters in the tropics. It is readily distinguished by the uniform olive upper parts, and the bright buff lores and rings around the eyes. The only species with which it is at all likely to be confused is the gray-cheeked thrush (*Turdus Aliciæ*), a bird of similar range and habits, without the buff lores and eye-rings, and formerly regarded only as a variety. The eggs of both are blue, spotted and speckled with bright brown. The hermit thrush may be easily recognized by the fact that the tail is rufous, brighter than the back. It is also a somewhat smaller and more slender bird than either the veery or wood-thrush. It is distributed over the whole of North America, but breeds mainly north of the United States. There are several varieties recognized by names, as in the preceding species, and, like that also, the Pacific Coast form is considered typical, while the bird occurring in the eastern part of the continent is counted a variety. Thus the olive-backed thrush of the East is the sub-species *Swainsonii* and the hermit thrush of the same region is the subspecies *Pallasii*. The latter is one of the most renowned songsters of America, although, on account of its northern breeding grounds and retiring habits, few persons hear it. While some regard the notes as not essentially superior to those of the wood-thrush, most writers on bird music agree that for "purity and sweetness of tone and exquisite modulation" the hermit is unequaled. The nest and eggs are very similar to those of the veery.

The thrushes of the Old World are numerous and well-known birds, of which several are common in Great Britain, as the song-thrush or 'mavis,' the mistle-thrush, blackbird, ouzel, fieldfare, and redwing (qq.v.).

The name thrush is sometimes given to birds of other families, which are exceptional songsters. Thus in the United States the thrasher (q.v.), one of the finest singers we have, is often called 'brown thrush,' although more nearly a wren. On the other hand, various members of the family are known by other names, as the bluebird, robin redbreast, stonechat, and various small Oriental genera.

The Turdinæ, characterized by the fact that the young are constantly spotted, although they may become concolorous when adult, is only one of the five subfamilies into which the great thrush family (Turdidæ) is divided. The other subfamilies are the Myiodectinæ, a small group of brownish flycatcher-like birds; the Sylviinæ, or Old World warblers (see WARBLER); the Polioptilinæ, or gnat-catchers and wren-tits (qq.v.); and the Miminæ, or American mocking-birds, including the incomparable mocking-bird of our Southern States. It should be added that some ornithologists object to this widely inclusive use of the family name. Consult authorities cited under BIRD. See Colored Plate of SONG BIRDS.

THRUSH (dialectic Swed. *trösk*, Swed. *torsk*, tongue-thrush; perhaps connected with *torr*, OHG. *durri*, Ger. *dürr*, Goth. *þaúrsus*, AS. *þyrre*, dry, and ultimately with Eng. *thirst*). An inflammation and ulceration of the sensitive surfaces within the frog of horses' feet, giving rise to a fetid discharge, constituting unsoundness, and usually causing lameness. Want of cleanliness is the chief cause. The disease is most common in draught horses. The term thrush is often applied to foot-and-mouth disease (q.v.).

THRUSH; SPRUE; INFANTILE SORE MOUTH. A disease of early infancy, characterized by the presence of small, roundish, white specks or patches on the lining membrane of the cavity of the mouth and throat, on the surface of the tongue, the angles of the lips, etc. These patches, which are termed *aphthæ*, look like minute drops of tallow or fragments of curd, and are formed by elevated portions of epithelium covering a drop of serous fluid; and as the dead epithelium falls off, a red, usually a raw, surface is left exposed. The cause is a fungus, the *Oidium* (or *Saccharomyces*) *albicans*, which combines with cast-off epithelial cells and with food (milk) to form the spongy, fragile membrane. In thrush crops of these little patches commonly succeed one another. These spots render the mouth hot and tender, in consequence of which the act of sucking is accompanied by difficulty and pain. In association with these local symptoms are indications of general constitutional disturbance, such as feverishness, drowsiness, sickness, flatulence, colicky pains, diarrhœa, etc. The stools are green and slimy, and not unfrequently acrid, as may be inferred from redness of the anus being a common symptom. The vomited matters are also green, and have a strongly acid smell, as also has the breath. The complaint sometimes seems to be the result of improper diet, if the child is being brought up by hand, or of unwholesome milk from a diseased or intemperate nurse; of bad ventilation, etc.; but in some cases the cause of the disease is not evident. The disorder usually lasts eight or ten days, and is attended with danger only when the local affection becomes gangrenous. In older children thrush is an indication of more serious import, appearing in those who are already ill. Nutrition is then still further impaired and the membrane may be a very unfavorable symptom. The treatment is absolute cleanliness of the nursing bottle and nipple, cleansing of the child's mouth with boracic acid and glycerin or a 50 per cent. solution of borax in water, or a weak solution of potassium permanganate. The diet must be corrected, and sugar must be withdrawn entirely.

THUCYDIDES, thū-sĭd'ĭ-dēz (Lat., from Gk. Θουκυδίδης, *Thoukydidēs*) (?-c.399 B.C.). A famous Greek historian, son of Olorus and Hegesipyle, born in the Attic deme Halimus. The date of his birth is unknown, but was certainly not earlier than B.C. 470 nor later than 454. Conservative opinion now favors a date near the latter year. By descent he belonged to an ancient aristocratic family on one side, and on the other was connected with a line of Thracian princes. From this Thracian side of his family he possessed gold mines in Thrace opposite the island of Thasos. He was well educated; tradition says that he was the pupil of Antiphon and Anaxagoras. In politics he favored the aristocratic party, but his views are all marked by moderation and fairness. When the Peloponnesian War broke out, Thucydides was of an age to enable him to discern the importance of the contest and to form plans for recording its course and result. In 424 he was appointed to command a portion of the fleet off the Thracian coast, and in the same year he failed to arrive in time to relieve Amphipolis, which was besieged by Brasidas. For this failure he was condemned to death for treason, but left Athens and lived the next twenty years in exile. This period he spent partly on his estates in Thrace and partly without doubt in examination of the scenes of the war in Italy and Sicily. He also resided for a time at the Court of King Archelaus in Macedonia. After the defeat of the Athenians and the restoration of the democracy in 403, Thucydides was recalled from exile. His death apparently took place about 399. Thucydides's history, which covers twenty-one years of the Peloponnesian War, was not completed by him;

it breaks off in the middle of the year 411. It is also evident that the last book did not receive its final form, but there is no reason to doubt that it comes from his hand. The present division into eight books was not made by the author, but by later grammarians.

Thucydides is now regarded by all as the first critical historian and the greatest historian of antiquity. He brought to his undertaking a practical acquaintance with politics and military science, his natural endowments fitted him to pass impartial judgment on the events that he narrates, and he emphasizes more than once the care with which he endeavored to find out the truth. His sources were for the main part obtained by personal observation or by questioning those who had been upon the ground; but for the earlier period he depended upon his predecessors. His purpose being to narrate the war, he clung closely to his subject and made few digressions, so that we have to regret that he has nothing to say of literature, art, or the conditions of the people. But the military movements of the time are portrayed with a vividness which has never been equaled. In form, his history is strictly annalistic, the account being given by summers and by winters, so that his work suffers from his failure to group events effectively. His style is the older Attic. His periods are not polished or rounded out, and in his effort after brevity he often makes his meaning obscure and hard to reach. Yet his style was greatly admired in antiquity, and became the model of many historians in the following centuries. In his characterization of the leaders in the struggle between Athens and Sparta he was most successful, and frequently employs with great skill speeches which he puts into their mouths. Of critical editions the most important are by Bekker (3 vols., Berlin, 1821); Haase (Paris, 1846); Hude (2 vols., Leipzig, 1898-1901). There are annotated editions by Thomas Arnold (3 vols., 3d ed., Oxford, 1847-54); Bloomfield (2 vols., London, 1842-43); Krüger (2 vols., 3d ed., Berlin, 1861); and Classen (8 vols., Berlin, 1862-78; frequently re-edited). English translations have been made, single volumes of the Classen edition, by Morris, Fowler, and Smith for the College Series of Greek Authors (Boston). The editions of single books are very numerous. Consult, also: the *Lexicon Thucydideum* by Bétant (Geneva, 1843); *Index Thucydideus* by Von Essen (Berlin, 1887). The best English translations of the history are by Bloomfield (3 vols., London, 1829); Dale, in the Bohn Classical Library; and Jowett, with introduction and historical notes (2 vols., London, 1881; Boston, 1883). On the speeches see Wilkins's translation (3d ed., London, 1881), and Jebb's essay in Abbott's *Hellenica* (London, 1880).

THUG (Hind. *ṭhag*, cheat, from Skt. *sthaga*, rascal). The name in Northern India of a religious fraternity which committed murders in honor of Kali, (q.v.), the wife of Siva, and lived chiefly upon the plunder obtained from its victims. In the south of India they used to live under the protection of the native chieftains in consideration of a settled contribution, and probably also of a share in their booty. The Thugs were first generally known about 1800, although they existed as early as 1290. Although at the beginning of the nineteenth century they had become little more than murderers, the original religious character of their deeds survived in many ways, particularly in the bloodless character of their assassination, which points back to an unbloody sacrifice in honor of the female aspect of the destructive power of nature. They really formed a caste, as the profession was in the main hereditary, and the young Thugs were trained most carefully, although a few recruits were admitted from without, and a considerable number of Mohammedans joined the order. When they learned through some of their gang that persons of property were about to undertake a journey, they usually proposed to them, under the plea of safety, or for the sake of society, to travel in their company; or else they followed them. Usually they threw around the neck of the victim a cloth called the *romal*, or handkerchief, with a knot in the left end, which one of the gang held at one end, while the other was seized by an accomplice. While the two Thugs drew the noose tight and pressed the head of their victim forward, a third seized him by the leg and thus threw him to the ground. If properly strangled, the sacrifice was dead before he touched the ground. The utmost care was taken to commit the murder in an unfrequented spot, and the body was buried at a spot where it was not likely to be found.

Another class of Thugs murdered those in charge of children, whom the assassins then sold into slavery. Castes or classes exempt from the Thugs were washermen, sweepers, musicians, poets, blacksmiths, carpenters, oil-venders, cripples, lepers, bearers of the holy Ganges water, and those who had with them a cow. Neither would a true Thug kill a woman. A portion of the plunder was usually devoted to the expenses of religious ceremonies, and a part was often allotted for the widows and families of deceased Thugs.

Kali was believed to have formerly coöperated with the Thugs, and to have assisted them in the disposing of the bodies of their victims by devouring them. But through an indiscretion of one of the fraternity, who looked back, she became displeased, and condemned them to bury their victims. But though she refused her assistance, she presented her worshipers with one of her teeth for a pickaxe, a rib for a knife, and the hem of her lower garment for a noose. On the faith of this legend the pickaxe was the instrument which was held in the highest estimation by all the Thugs. Its fabrication was superintended with the greatest care, and it was the subject of other ceremonials. After every murder the Thugs performed a special solemnity called *tapuni*, which was celebrated in honor of Kali. Another feast observed by the Thugs throughout India was called *Kurhae Karna* or *Kote*, likewise in honor of Kali. The superstitions of the Thugs were of Hindu origin; but they were adopted also by Mohammedan Thugs, who sometimes identified Kali and Fatima.

At various periods steps were taken by the native and English governments to suppress the Thugs, but it was only after 1831 that energetic measures against them were adopted by the British authorities. By 1840 they were practically suppressed.

Consult: Sleeman, *Ramaseeana* (Calcutta, 1836); Thornton, *Illustrations of the History* *and Practices of the Thugs* (London, 1837); Meadows-Taylor, *Confessions of a Thug* (ib., 1839; new ed. ib., 1879); Wright, *India and Its Inhabitants* (Cincinnati, 1855); Hutton, *Popular Account of the Thugs and Dacoits* (London, 1857).

THUGUT, tōō'gōōt, FRANZ MARIA, Baron (1736-1818). An Austrian statesman, born at Linz. He was admitted to the Oriental Academy in Vienna in 1752, went to Constantinople in 1754, and became Court interpreter at Vienna in 1766. He was appointed diplomatic representative at Constantinople in 1769 and obtained the cession of Bukowina to Austria in 1771. In 1780 he was made Austrian Ambassador at Warsaw and in 1787 at Naples. He negotiated the Peace of Sistova with Turkey in 1790; was made Director-General of Foreign Affairs in 1793, in which capacity he continued the anti-Prussian policy of Kaunitz, but sought also to advance Austrian interests at the expense of France. This plunged the country into the disastrous war with Revolutionary France, which ended with the Peace of Campo-Formio (q.v.) in 1797. After acting for some time as administrator in the newly acquired Italian provinces, he took up his old post in the Ministry. He retired in 1800 and devoted the rest of his life, at Pressburg and Vienna, to the study of Oriental literature.

THULE, thū'lē (Lat., from Gk. Θούλη, *Thoulē*). The name generally given by the ancients to the most northerly part of Europe known to them, and in the description of which fancy played a conspicuous part. According to Pliny it was an island in the northern ocean, discovered by the navigator Pytheas (q.v.), who reached it after six days' sail from the Orcades. Many modern geographers identify Thule with Iceland. Some, however, prefer to seek for it in that part of Norway called *Thile* or *Thilemark*, or in Jutland, the extremity of which is known as *Thy* or *Thyland*. But it seems that Mainland, the principal member of the Shetland group, has the best claim to being regarded as the Thule of Pytheas. The Romans used the phrase *Ultima Thule* to denote the most distant unknown land.

THUMANN, tōō'män, PAUL (1834—). A German illustrator and painter, born in Tschacksdorf, Brandenburg. He studied in Berlin, Dresden, and Weimar, and taught successively in the academies of Weimar, Dresden, and Berlin. He illustrated Chamisso's *Frauenliebe und -Leben* and *Lebenslieder und -Bilder*, Goethe's *Dichtung und Wahrheit*, Hammerling's *Amor und Psyche*, Heine's *Buch der Lieder*, Tennyson's *Enoch Arden*, etc. His paintings include five scenes from the life of Luther (1872-73), in the Wartburg, near Eisenach, and two large mural paintings, "Return of Arminius from the Teutoburg Forest" and "Baptism of Wittekind," in the Aula of the Gymnasium at Minden.

THUMB, TOM. See STRATTON, CHARLES SHERWOOD.

THÜMMEL, tụ'mel, MORITZ AUGUST VON (1738-1817). A German statesman and humorous writer, born at Schönefeld. In 1768 he became minister to Duke Ernest Frederick of Saxe-Coburg, from whose service he retired in 1783. He wrote a humorous prose epic *Wilhelmine* (1764); a story in verse, *Inokulation der Liebe* (1771); and a partly autobiographical and once very popular novel, *Reise in die mittäglichen Provinzen von Frankreich* (1791-1805). *Der heilige Kilian* was posthumously published in 1818. His works (in 6 vols., 1812) were edited by himself with a biography (1820) by Gruner, and reëdited (8 vols., 1854-55).

THUN, tōōn. A town of Switzerland, situated on the Aar, near where it issues from the Lake of Thun, 19 miles southeast of Bern, 1845 feet above sea level, and one mile from the Lake of Thun (Map: Switzerland, B 2). The old castle of the twelfth century with its corner towers and the Gothic church are the chief buildings. There is a military institution for army officers, as the town is the chief artillery arsenal of Switzerland. The chief manufactures are pottery and bricks. Many tourists visit the town on their way to the Bernese Oberland. Population, in 1900, 6100.

THUN, LAKE OF. A lake in the Canton of Bern, Switzerland, between the town of Interlaken on the east and that of Thun on the northwest (Map: Switzerland, B 2). It is 10½ miles long and 2½ miles wide. The scenery, though scarcely grand, is very attractive. The railway from Thun to Interlaken skirts the southern shore.

THUNBERG, tōōn'bĕrk, KARL PETER (1743-1828). A Swedish botanist. He studied with Linnæus at Upsala; sailed with a Dutch ship as surgeon (1771-73), cruising at the Cape of Good Hope; lived six years in Java and Japan, returning in 1779 to Sweden, where he was appointed successor to Linnæus in 1781 as professor of botany at the University of Upsala. A genus of about fifty species of the natural order Acanthaceæ and numerous Oriental species of other genera are named in his honor.

THUNDER. See LIGHTNING.

THUNDERING LEGION. The name given to a body of Christian troops under Marcus Aurelius, from the tradition that a thunderstorm, sent in response to their prayers, caused great destruction in the opposing army.

THÜNEN, tụ'nen, JOHANN HEINRICH VON (1783-1850). A celebrated German economist, born in Oldenburg. After receiving a thorough education in the theory and practice of agriculture and passing two semesters at Göttingen, he bought in 1810 an estate called Tellow, in Mecklenburg-Schwerin, which under his skillful management became famous as a model farm. His fame rests on his work *Der isolirte Staat in Beziehung auf Landwirtschaft und Nationalökonomie*, the first volume of which appeared in 1826, the second in 1850 and 1863, and the third in 1863. In this work Thünen simplified the complex conditions of economic life by imagining an isolated State, circular in form, with land of equal fertility, laborers of equal productivity, and with the sole city and market at the centre. Having so simplified his premises, he proceeded to investigate, principally, the effect of distance from the market upon the agricultural economy of the several zones of the territory surrounding the market. In the second volume Thünen struck a new note in the political economy of his time by protesting against the common treatment of wages as the price of an inanimate commodity, and insisting upon the introduction of ethical factors. His treatment here, as generally, was highly abstract, and with the aid of the differential calculus he arrived at the conclusion that natural wages $= \sqrt{ap}$, where a is the amount required to support the laborer and his family and p is the product of the labor of one man, this product being defined as that part of the gross product remaining after deduction of profits, insurance, and cost of management. This law of wages expresses in a highly interesting way the modern theory that wages vary as the productivity of the laborer. At Thünen's request it was engraved on his tombstone. Consult: Schumacher, *J. H. von Thünen, ein Forscherleben* (Rostock, 1883); Moore in the *Quarterly Journal of Economics*, vol. xiv., pp. 291, 388. See POLITICAL ECONOMY.

THUN UND HOHENSTEIN, tōōn ụnt hō′ẹn-stīn, LEO, Count (1811-88). An Austrian statesman, born at Tetschen, in Bohemia. Before the Revolution of 1848 he was secretary in the Imperial Chancery, and in that year became Governor of Bohemia. From 1849 to 1860 he was Minister of Public Worship and Instruction. In spite of his reactionary tendencies, he introduced many reforms in the system of secondary and higher education, which he reorganized on the German model. He concluded the Concordat of 1855, which gave the Church great power in educational affairs. In 1861 he was elected to the Bohemian Diet, where he became the leader of the Feudalists, and he continued this attitude in the Austrian House of Peers, which he entered in the same year. In 1867 he strenuously opposed the Ausgleich with Hungary. He retired from the Bohemian Diet in 1871, and reëntered it in 1883.

THUR′BER, GEORGE (1821-90). An American botanist, naturalist, and editor. He was born at Providence, R. I., where he obtained his early education. From 1850 to 1853 he was botanist, commissary, and quartermaster of the United States Boundary Commission upon the Mexican and United States borders, where he collected a large number of new species of plants. In 1856 he became lecturer upon botany and materia medica in the Cooper Union and College of Pharmacy of New York, and in 1859 professor of botany and horticulture in the Michigan Agricultural College, which institution he left in 1863 to become editor of the *American Agriculturist*, a post which he held until shortly before his death. In addition to his editorial writings he also edited all the horticultural and agricultural books published by the Orange Judd Company, and revised and in part rewrote Darlington's *Agricultural Botany*.

THURET, tụ′râ′, GUSTAVE (1817-75). A French botanist, born in Paris. While attached to the French embassy at Constantinople he collected plants in the Balkan Peninsula, and returned to France in 1844. His specialty was algæ and his *Recherches sur les zoospores des algues et les anthéridées des cryptogamis* (1851) were crowned by the Academy. Other publications include: *Recherches sur la fécondation des fucacées* (1855-57), and numerous monographs, such as *Essai de classification des nostochinées* (1875). He established a splendid botanical garden at Antibes, where he planted the first eucalyptus trees in Europe, and which he bequeathed to the State. He died at Nice.

THURGAU, tōōr′gou. A canton in the northeast of Switzerland, separated from Germany by Lake Constance (Map: Switzerland, D 1). Area, 388 square miles. The surface is elevated but not mountainous, and is cut by the valley of the Thur, the chief river of the canton. Almost the entire area of the canton is productive, and the chief occupations of the inhabitants are agriculture and viticulture. Stock-raising and cheese-making are also important industries. The principal manufactures are cotton and woolen goods, knit goods, machinery, leather, etc. The constitution of the canton is purely democratic, the members of the legislative assembly as well as of the executive council being elected directly by the people. The obligatory referendum and the initiative are in force. Population, in 1888, 104,678; in 1900, 113,221, largely German-speaking Protestants. Capital, Frauenfeld (q.v.).

Prior to the ninth century the country known as Thurgau comprised almost the entire region bounded by Lake Lucerne, the Rhine, the Reuss, and Lake Constance. With the extinction of the house of Kyburg, Thurgau, reduced almost to its present size, passed in 1264 to the House of Hapsburg. In 1460 the country was seized by the Confederates and occupied the position of a 'subject district' until 1798, when it was made a canton of the Helvetic Republic. In 1803 it was constituted a canton of the reorganized Swiss Confederation. Consult: Pupikofer, *Geschichte des Thurgaus* (Frauenfeld, 1884-89); Meyer, *Thurgauisches Urkundenbuch* (ib., 1881 et seq.).

THURIFER (Lat., incense-bearer). The attendant in the Roman Catholic Church, at solemn mass, vespers, and other ceremonies, whose duty it is to carry the thurible, or incense vessel, and either to minister incense himself, or to present the thurible for that purpose to the officiating priest. The office of thurifer originally belonged to the so-called 'minor order' of acolyte, but is now commonly exercised by laymen. See INCENSE; CENSER.

THÜRINGER WALD, tụ′rĭng-ẽr vält (Ger., Thuringian Forest). A mountain range of Central Germany, extending from the banks of the Werra near Eisenach in a southeasterly direction to the northern boundary of Bavaria, where it joins the Frankenwald, a ramification of the Fichtelgebirge (Map: Germany, D 3). It forms the southwestern boundary of the highland of Thuringia, and passes through Saxe-Weimar, Coburg-Gotha, Prussia, Saxe-Meiningen, and the neighboring small States. Length, about 70 miles; highest summit, Gross-Beerberg, 3238 feet. The range falls steeply toward the northeast and is covered to the summits with magnificent pine forests. It is composed mostly of granite, porphyry, and schists protruding through the surrounding Permian strata, and is rich in minerals, among which iron ore, copper, manganese, and gypsum are the most important. The range passes through a well-populated industrial region.

THURIN′GIA (Ger. *Thüringen*). A picturesque region of Germany, traversed by the Thüringer Wald (q.v.), lying between the Prussian Province of Saxony on the north and Bavaria on the south, and between the Kingdom of Saxony on the east and the Prussian Province of Hesse-Nassau on the west. It embraces a number of duchies and principalities together with some Prussian districts. The so-called Thuringian States are Saxe-Weimar-Eisenach, Saxe-Coburg-Gotha, Saxe-Meiningen, Saxe-Altenburg, Schwarzburg-Rudolstadt, Schwarzburg-Sondershausen, and the two Reuss principalities. The largest city is Erfurt, in the Prussian Province of Saxony. The region took its name from the Thuringians, who at the time of the great migration of nations established an extensive kingdom near the centre of the present Germany. In the early part of the sixth century the Franks overthrew this kingdom, of which the northern part was joined to the country of the Saxons, and the southern to Franconia. The name Thuringia came to be applied to the country between the rivers Werra and Saale, and the Harz and Thuringian mountains. Under the weak Merovingian rulers dukes arose in this Thuringia, which for a time was virtually independent. Christianity was introduced in the eighth century. Under the Carlovingian sovereigns Thuringia constituted an important frontier province or march, whose governor was charged with the task of repressing or keeping down the Slavic Serbs. In the tenth century the country was under the rule of the dukes of Saxony. In the twelfth and thirteenth centuries the landgraves of Thuringia held a prominent place among the German princes. They had their seat at the famous Castle of Wartburg. (See EISENACH.) Landgrave Hermann I. (1190-1216) is noted as a patron of the minnesingers. The old dynasty of landgraves became extinct in 1247. The landgravate of Thuringia then passed to the House of Wettin, which ruled in the margraviate of Meissen, and which in the fifteenth century came into possession of the electoral duchy of Saxony. On the partition of the Saxon dominions in 1485 between the Ernestine and Albertine lines the bulk of the Thuringian possessions passed to the Ernestine or electoral branch. After the War of the Schmalkald League (1546-47) the Ernestine house was stripped of its possessions outside of Thuringia. Here arose the various modern Saxon (Thuringian) duchies. See SAXE-WEIMAR-EISENACH. Consult: Knochenhauer, *Geschichte Thüringens in der karolingischen und sächsischen Zeit* (Gotha, 1863); id., *Geschichte Thüringens zur Zeit des ersten Landgrafenhauses* (Gotha, 1871).

THURLOE, thûr'lō, JOHN (1616-68). An English Puritan statesman. After Cromwell was proclaimed Protector, Thurloe was appointed chief of the intelligence department, a position which he managed with striking fidelity and success. He continued as Secretary of State under Richard Cromwell until May, 1659, and in spite of royalist opposition in 1660, was reappointed prior to the Restoration. After Charles II.'s return he was arrested on a charge of high treason, but soon afterwards was freed on condition of attending on the secretaries of State whenever they should require his service. His large collection of State papers and correspondence, comprising the most authentic materials respecting the period of the Civil War and Cromwell's Protectorate, were discovered in a secret recess in his chambers at Lincoln's Inn during the reign of William III., and are now in the Bodleian Library at Oxford. Dr. T. Birch issued a *Collection of State Papers; containing authentic memorials of the English affairs from the year 1638 to the Restoration of King Charles II., published from the originals, etc.*, prefixed by a Life of Thurloe (London, 1742).

THUR′LOW, EDWARD, Baron (1731-1806). An English lawyer. He was born at Bracon-Ash, Norfolk, was educated at Caius College, Cambridge, and was admitted to the bar in 1754. At this time he formed an intimate friendship with the poet William Cowper. Through the patronage of the Viscount Weymouth, Thurlow was elected to Parliament in 1768. In 1770 he was appointed Solicitor-General, and the next year Attorney-General. He attracted the favorable notice of George III. by zealously supporting the governmental policy of coercing the American colonies, and in 1778 was made Chancellor of the Exchequer, which office he retained under the Rockingham Administration. In this position he caused great embarrassment by opposing measures brought in by that Government. Under the Coalition Ministry he was compelled to retire; but he was restored as Chancellor when Pitt came to power. For a time he supported the Government; but, relying on the favor of the King, he finally ventured to oppose the measures of his colleagues. Pitt then intimated that he or Thurlow must retire, and the King consented to the removal of Thurlow (1792). There is little to justify the great reputation for ability he had among his contemporaries. Consult Foss, *Judges of England, with Sketches of Their Lives* (London, 1848-64).

THUR′MAN, ALLEN GRANBERY (1813-95). An American political leader and legislator, born in Lynchburg, Va. In 1819 he was taken by his parents to Chillicothe, Ohio. He studied law in the office of his uncle, William Allen (q.v.); became private secretary to Governor Robert Lucas in 1834, and in the following year was admitted to the bar and was taken into partnership by his uncle. In 1845-47 he was a Democratic member of Congress, then resumed his law practice, and from 1851 to 1856 was on the bench of the Ohio Supreme Court, after December, 1854, as Chief Justice. In 1867 he was the Democratic candidate for Governor of Ohio, but was defeated by Rutherford B. Hayes. From 1869 to 1881 he was a member of the United States Senate, and the leader of the small party of Democrats in that body. In the Forty-sixth Congress he was elected president *pro tempore* of the Senate. He was active as an advocate of a liberal reconstruction policy, was one of the authors of the bill creating the Electoral Commission in 1876, and was a member of that body. He was also the author of the well-known 'Thurman Act,' designed to compel the Pacific railroads which had received Government aid to fulfill their obligations to the Government, and secured the passage of the bill. In 1881 he was appointed by President Garfield a member of the International Monetary Conference at Paris. In 1888 he was nominated by acclamation for Vice-President on the Cleveland ticket, which was defeated by Harrison and Morton. Consult Hensel and Parker, *Lives and Public Services of Grover Cleveland and Allen G. Thurman* (New York, 1888).

THURN, tōōrn, HEINRICH MATTHIAS, Count (1580-1640). A leader of the Bohemian Protestants in the Thirty Years' War. For his services in the Turkish wars, the Emperor Rudolph II. made him Burgrave of Karlstein in Bohemia. He was among those who wrung from Rudolph the *Majestätsbrief* of 1609, an edict of toleration, and was named by the Bohemian estates one of the 'Thirty Defenders of the Faith.' He was deprived of his estates and title soon after. On May 23, 1618, he gave the signal for the Protestant uprising in Bohemia by the 'defenestration' of the Imperial legates at Prague. (See THIRTY YEARS' WAR.) At the head of the Protestant forces he besieged the Emperor Ferdinand II. in Vienna (1619), but was finally compelled to withdraw. After the battle of the White Hill in 1620, in which the army of Frederick, the Protestant King of Bohemia, was vanquished, he sought refuge with Bethlen Gábor, ruler of Transylvania. In 1626 he commanded a corps in Silesia. Later he joined Gustavus Adolphus, and fought at Leipzig (1631) and Lützen (1632). He was captured by the Imperialists in 1633 at Steinau, but was soon released.

THURNEYSEN, tōōr′nī-zen, RUDOLPH (1857—). A German philologist. He was born in Basel, and studied at the universities of Basel, Leipzig, and Berlin. From 1882 to 1887 he was successively privat-docent and assistant professor of Romance philology in the University of Jena, and after 1887 professor of comparative philology at the University of Freiburg in Baden. Among his more important publications are: *Ueber Herkunft und Bildung der lateinischen Verba auf -io* (1879); *Das Verbum être und die französische Conjugation* (1882); *Keltoromanisches* (1884); *Der Saturnier und sein Verhältnis zum späteren römischen Volksverse* (1885); *Mittelirische Verslehren* (1891); *Sagen aus dem alten Irland* (1901).

THURS′BY, EMMA (1857—). An American singer, born in Brooklyn, N. Y. She studied under Julius Meyer and Erani, and sang in the Plymouth Church choir, Brooklyn, 1870, after which she went to Italy to study in 1873, and returned to complete her musical education under Erani and Mme. Ruderstdorf. She made a successful tour of the United States and Canada (1875), and was warmly received in England and France (1878-79), afterwards being engaged by Maurice Strakosch as prima donna of his company (1880). A subsequent tour of the United States with Theodore Thomas was especially successful, and she frequently appeared in concert with Annie Louise Cary (q.v.). Her concerts in Europe were noteworthy, and gave her high rank as a concert singer.

THURSTON, JOHN MELLEN (1847—). An American politician and lawyer, born in Montpelier, Vt. He removed to Wisconsin, where he was educated at Wayland Academy, Beaver Dam, and in 1869 was admitted to the bar. In the same year he settled in practice in Omaha, Neb. He allied himself with the Republican Party, and was elected to the State Legislature in 1875. In 1895 he was elected to the United States Senate. Upon the termination of his Senatorial term in 1901 he was appointed one of the United States Commissioners for the Louisiana Purchase Exposition at Saint Louis.

THURSTON, ROBERT HENRY (1839-1903). An American engineer and educator, born in Providence, R. I. He graduated at Brown University in 1859. During the Civil War he served in the Federal Navy as an engineer, and in 1865 he was appointed assistant professor of natural and experimental philosophy at the United States Naval Academy. He was professor of engineering at the Stevens Institute of Technology from 1871 to 1885, and in the latter year, for a committee of the American Institute, conducted a series of important experiments on steam boilers. He was a member of the United States Scientific Commission to the Vienna Exhibition in 1873, and edited the *Report* of the Commissioners, which included his individual report on machinery and manufactures (1875-76). From 1885 he was director of Sibley College of Cornell University. His thoroughness, organizing ability, and energy placed him in the very front rank of educators in his field, while his admirable personality excited the respect and regard of his students. Hardly less important in their influence upon the engineering world are Professor Thurston's writings, not alone because of their thorough reliability, but because of their clearness and comprehensibility, this being particularly true of such works as *A History of the Growth of the Steam Engine* ("International Scientific Series," 1878, 1901, translated into German and French), a treatise which is at once popular in form of presentation, and exact and authoritative in its subject matter. His other works include: *Manual of the Steam Engine* (1890, 1901); *Materials of Engineering* (1882, 1900); *Materials of Construction* (1884, 1900); *Stationary Steam Engines* (1885, 1889); *Treatise on Friction and Lost Work in Machinery and Mill Work* (1885, 1898); *A Manual of the Steam Boiler* (1888, 1901); *A Handbook of Engine and Boiler Trials, and the Use of the Indicator and the Pony Brake;* and *Life of Robert Fulton* ("Makers of America Series," 1891). Professor Thurston's inventions include a magnesium-ribbon lamp, a magnesium-burning naval and army signal apparatus, an autographic recording and testing machine, a form of steam-engine governor, and an apparatus for determining the value of lubricants.

THWAITES, REUBEN GOLD (1853—). An American historical writer, born in Dorchester, Mass. In 1866 he removed to Wisconsin. From 1876 to 1886 he was managing editor of *The Wisconsin State Journal,* at Madison. In 1886 he was elected secretary of the State Historical Society of Wisconsin, and editor of the society's *Collections.* He edited the *Wisconsin Historical Collections* (vols. ix. to xv.); *Chronicles of Border Warfare* (1895); a new edition of Kinzie's *Wau Bun* (1901); and *The Jesuit Relations* (73 vols., 1896-1901), his work on the last being one of the most careful and scholarly pieces of historical editing ever done in America. He also published: *Historic Waterways* (1888); *The Story of Wisconsin* (1890), in "Story of the States Series;" *The Colonies, 1492-1750* (1891), in "Epochs of American History Series;" *Afloat on the Ohio* (1897); *Stories of the Badger State* (1900); *Daniel Boone* (1902) and *Père Marquette* (1903), the last two in the "Pioneers of America Series," of which he is editor; and *George Rogers Clark* (1903).

THWING, twĭng, CHARLES FRANKLIN (1853—). An American clergyman and educator, born at New Sharon, Maine. He graduated from Harvard in 1876, and from the Andover Theological Seminary in 1879; was pastor of the North Avenue Presbyterian Church at Cambridge, Mass., in 1879-86, and of Plymouth Church, Minneapolis, in 1886-90; and in 1890 became president of Adelbert College and Western Reserve University. He published: *American Colleges* (1878); *The Reading of Books* (1883); *The Family* (in collaboration with his wife, Carrie F. Butler Thwing, 1886); *The Working Church* (1888); *Within College Walls* (1893); *The College Woman* (1894); *The American College in American Life* (1897); *American College Administration* (1900).

THYESTES, thī-ĕs'tēz (Lat., from Gk. Θυέστης). The son of Pelops and Hippodamia. Having seduced Ærope, the wife of his brother Atreus, he was banished from Mycenæ, and in revenge sent Plisthenes, the son of Atreus, whom he had brought up, to slay his father. Atreus, not recognizing Plisthenes, killed him, and summoning Thyestes to Mycenæ, placed before him at a feast the flesh of his two sons.

THYME, tīm (OF., Fr. *thym*, from Lat. *thymum*, from Gk. θύμον, θύμος, thyme, sweetbread, warty excrescence; connected with θύος, *thyos*, incense, Lat. *fumus*, OChurch Slav. *dymŭ*, Lith. *dúmai*, OHG. *toum*, Skt. *dhūma*, smoke), *Thymus*. A genus of humble half-shrubby plants, of the natural order Labiatæ, having a two-lipped calyx and four diverging stamens. Garden thyme (*Thymus vulgaris*) is 6 to 10 inches high, with narrow, almost linear leaves, and whitish or reddish flowers, which grow in separate whorls, six in a whorl. It is common upon dry hills in Southern Europe, and is very commonly cultivated in gardens, on account of its fragrance and as a culinary herb. It is also used in medicine. Wild thyme (*Thymus Serpyllum*) has a procumbent stem with many branches, 2 to 3 feet long, oval leaves, and purplish flowers, arranged in whorls, which are united in a head. It is abundant on hills and mountains in all parts of Europe and Northern Asia. It is less fragrant than garden thyme, but both species contain an aromatic essential oil. The lemon thyme, or lemon-scented thyme, is a variety of *Thymus Serpyllum.* It is generally of still lower growth than the common garden thyme. No species of thyme is indigenous in America.

GARDEN THYME.

THYMUS GLAND (Neo-Lat., from Gk. θύμος, thyme, so called from its fancied resemblance to a branch of sweet thyme). A ductless gland, peculiar to infantile life. In the human being it occupies a space in the neck below the thyroid gland and in the chest beneath the sternum in the anterior mediastinal space, on the level of the fourth costal cartilage. The gland is developed early in fœtal life, increases in size during the first two or three years of life, then remains stationary until the tenth to the fourteenth year, when it begins to atrophy and undergo fatty degeneration. At its maximum period of development the organ is above two inches long, one and one-half inches broad, and about a third of an inch thick. At birth its weight is about half an ounce. Beyond its character as a lymph gland little is known of the function of this organ. The thymus gland of young animals such as the lamb and calf constitutes the delicacy known as *sweetbreads*, though the pancreas or 'belly sweetbread' of certain animals is often substituted in trade for this article. Thymus has been used in medicine in the treatment of exophthalmic goitre. See ORGANOTHERAPY.

THYROID GLAND (from Gk. θυρεοειδής, *thyreoeidēs*, shield-shaped, from θυρεός, *thyreos*, large oblong shield, from θύρα, *thyra*, door + εἶδος, *eidos*, form). One of the ductless or vascular glands, lying at the upper part of the trachea, and consisting of two lateral lobes, placed one on each side of this canal, and connected together by a narrow transverse portion at the lower third, called the isthmus. It is of a brownish red color, and its normal weight is about an ounce. Each lobe is somewhat conical, and is about two inches long and three-quarters of an inch broad. Minute examination of the gland shows it to consist of lobes and lobules held together by connective tissue. Each lobule is made up of numerous completely closed sacs 0.04 to 0.1 inch in diameter. The sacs contain a transparent, viscid, albuminous fluid. Each sac is surrounded by a plexus of capillary blood vessels which do not pierce the lining of the sacs. Numerous lymphatic vessels are also present. At an early period the sacs dilate, their cellular lining atrophies, and their contents undergo colloid degeneration. The function of the thyroid gland is very obscure. It is possibly a blood-forming gland; possibly it regulates the formation of mucus in the body. It is subject to several varieties of enlargement known under the general name of goitre, and is also the seat of various benign and malignant tumors. *Myxœdema* (q.v.) is a condition of the system brought about through loss of function of the thyroid gland, either from atrophy or removal of the organ. The prepared extract of the thyroid gland of animals is used in the treatment of this condition. See CRETINISM; ORGANOTHERAPY.

THYR'SUS (Lat., from Gk. θύρσος, stalk, stem). An ivy and vine wreathed staff tipped with a pine cone, which was carried by Bacchus and his followers in the religious rites.

TI (Polynesian name), *Cordyline terminalis*. A tree-like plant of the natural order Liliaceæ, found in Southeastern Asia, the Eastern Archipelago, and the Hawaiian and other Pacific islands. It sometimes exceeds twelve feet in height. The reddish, lanceolate leaves are used as cattle food and as thatch for houses. Their fibres are sometimes made into cloth. The large, hard, fibrous, and almost insipid root becomes soft and sweet when baked. It is very nutritious, and is much used as an article of food. The juice is used for making sugar, a fermented beverage, and a distilled liquor. Fully twenty-five varieties of Cordyline are grown under glass for their ornamental, often variegated, foliage.

TIAHUANACO, tē-ä'wä-nä'kō. A ruined city of Bolivia, a few miles from the Peruvian frontier, on an arid plain midway between lakes Titicaca and Aullagas, at an elevation of 12,900 feet. The present town of the same name stands a short distance from the ruins and is built for the most part of beautifully cut stones from the ancient buildings. In the ruined town five great structures besides an equal number of shapeless mounds may be traced. These buildings are commonly known as the Fortress, the Temple, the Palace, the Hall of Justice, and the Sanctuary. The fortress consists of a rectangular mass of earth 620 feet long, 450 feet wide, and about 50 feet high, supported by walls of stone forming terraces, the walls sloping inward. On the summit are traces of rectangular buildings. Adjoining the pyramid to the east is a rectangular apron mound. The Fortress has been almost destroyed by excavations for treasures, but these diggings show that there were. subterranean structures within the mound. All the buildings of Tiahuanaco are oriented to within ten degrees of the cardinal points. The Temple, believed to be the oldest building here, is a rectangle 388 by 455 feet, defined by erect stones between 8 and 10 feet high, 2 by 4 feet broad, and from 20 to 30 inches thick. On the eastern side, aligned along a lower terrace, are ten columns about 15 feet high, by 4 feet by 3 feet. The interior of the rectangle is raised eight feet above the level of the ground and has a sunken court 280 feet long and 190 feet broad. To the east of the Temple is the Palace, of which the massive foundation remains, composed of blocks of trachyte 8 to 10 feet long and 5 feet wide. The piers of this building are deeply sunk in the ground and rest on a pavement of cut stones. The Hall of Justice stood at one end of a sunken court in a rectangle in plan like that of the Temple. It was a platform 131 feet long and 23 broad, built of enormous blocks of stone, and had three groups of alcoves or seats arranged at the ends and in the centre, and between the central and side groups were monolithic doorways with sculptured friezes. The Hall of Justice also stands on a raised area, in the centre of which was a building about 50 feet square, constructed of very large stones, and called the Sanctuary. Within the building is a slab of stone 13 feet 4 inches square and 20 inches thick. On its surface is cut what seems to be the plan of a building resembling that of the Fortress, and six niches in which perhaps statues were located.

Tiahuanaco is famous for its great monolithic gateway of hard trachyte 13 feet 5 inches long, 7 feet 2 inches high above ground, and 18 inches thick. The lintel over the front of the gateway is sculptured in low relief and the back is carved to represent doors and windows. The masonry at Tiahuanaco is laid without mortar, the stones on each course are tongued and grooved at the ends, and bronze pins and T-clamps were employed to hold the courses in place. Earlier travelers speak of statuary at Tiahuanaco, but these pieces have been destroyed except a head, which belonged to a figure probably about 18 feet high. The building stone was transported from 15 to 40 miles and the dressing was done with bronze and stone tools. There is no reliable tradition as to the builders, who it is supposed were the Incas or Aymarás, and no reason can be assigned for the location of the city on a barren plain at a great altitude, unless it be that the foundation was determined by religious ideas. Consult Stübel and Uhle, *Die Ruinenstätte von Tiahuanaco* (Breslau, 1892).

TIAN-SHAN, tē-än′ shän′, or CELESTIAL MOUNTAINS. A great mountain system of Central Asia. It begins in the southeastern part of Russian Turkestan, and extends in an eastward direction for nearly 1500 miles across East Turkestan toward the Desert of Gobi, in which it is gradually lost (Map: Persia, N 2). It forms the northern boundary of the great Tarim Basin, which it separates from the watersheds of Lake Balkash and the Syr-Darya. It is connected by broken ranges with the Altai Mountains to the north. The system consists almost throughout its length of a number of parallel ranges with a total width of about 200 miles. In the central portion there is a main ridge forming an unbroken wall covered with perpetual snow throughout its length, and culminating in the west in the Khan-Tengri, a peak bearing enormous glaciers and reaching an altitude of 24,000 feet. East of this ridge the mountains descend in a broad plateau with scattered peaks and ridges from 6000 to 10,000 feet high. West of the Khan-Tengri the system spreads out like a fan with numerous branches which finally lose themselves in the plains of Russian Turkestan. One of these ranges runs into the Pamir (q.v.), where, through the Sarikol, it connects with the Kuen-lun, Hindu-Kush, and Himalaya systems. In this western portion there are several important passes affording routes between Russian and East Turkestan. The system incloses numerous large longitudinal valleys whose bottoms form wide steppe regions. Above these the slopes are covered with immense spruce forests succeeded by an alpine flora to the snow-line. The loftiest group in the eastern portion, the Bogdo-ola, is held sacred by the Mongolians, and figures prominently in their religious mythology.

TIARA (Lat. *tiara*, *tiaras*, from Gk. *τιάρα*, *τιάρας*, *τιάρης*, head-dress of the Persian kings). The triple crown of the Pope. Although a cap called a tiara was worn by some Oriental monarchs, as by the Achæmenid dynasty of Persia, as an ecclesiastical head-dress it has more affinity with that of the Jewish high priests, the form of which is more or less preserved in the mitres worn by the bishops of the Eastern Church today. (See COSTUME, ECCLESIASTICAL.) It is composed of a high cap of gold cloth, encircled by three coronets, with a mound and cross of gold on the top. From the cap hang two pendants, embroidered and fringed at the ends. The original Papal crown consisted of the cap alone, and was first used by Pope Nicholas I. (858-867). Alexander II. added a second coronet about 1065, and Urban V. (1362-70) the third. A symbolic meaning has since been found in the triple crown, as representing the authority of the Pope over the Church militant, expectant, and triumphant. It is placed on the Pope's head at his coronation by the second cardinal deacon, with the words "Receive the tiara, adorned with three crowns, and know that thou art father of princes and kings, ruler of the world, vicar of our Saviour Jesus Christ." At ceremonies of a purely spiritual character the Pope wears the mitre, like other bishops, not the tiara.

TIBALDI, tē-bäl'dē, Pellegrino (1527-98). An Italian architect and painter, born at Bologna. A pupil of Daniele da Volterra in painting, he subsequently worked both as an architect and painter under the influence of Michelangelo in Rome, whither he had gone in 1547. His graceful altar-pieces, especially attractive through the loveliness of the female heads, are very rare. Of his frescoes "Hercules Taming the Animals" may still be seen in the Loggia dei Mercanti (Exchange) at Ancona. In architecture he is prominent as one of the chief representatives of the late Renaissance. In 1560-69 he built in Milan the Jesuit Church of San Fedele, in 1565 reconstructed the Archiepiscopal Palace, and in 1570 became first architect of the Cathedral, for which he designed the baroque façade. Called to Madrid by Philip II. in 1586 to take part in the erection of the Escorial, Tibaldi also decorated its library with warmly colored frescoes, was created Marchese di Valsolda, and after nine years returned to Milan, where he died. Consult: Zanotti, *Le pitture di Pellegrino Tibaldi* (Venice, 1756); and Gurlitt, *Der Barockstil in Italien* (Stuttgart, 1887).

TIB'BUS, TIBUS, or **TUBUS** (rock people). A Nigritian people inhabiting Tibesti, in the Eastern Sahara, and extending southward into the Sudan. In these different areas they vary greatly in hair and features. There are only 70,000 of them spread over an area of 300,000 square miles, under the following names: Tedas, Dasas, Bedeyat, Zoghawa, and Bulzeda. For generations they have been most active in the traffic by caravan across the Sahara. In religion they are Mohammedan. Consult: Nachtigal, *Sahara und Sudan* (Berlin and Leipzig, 1879-89); Rohlfs, *Quer durch Afrika*, vol. i. (Leipzig, 1874).

TI'BER (Lat. *Tiberis*, poetical *Thybris;* Ital. *Tevere*). The principal river of Central Italy. It rises in Tuscany, at the south of the Monte Fumajolo, in the Province of Arezzo, about thirty miles east of the source of the Arno, at an altitude of more than 3600 feet above the level of the sea, and flows toward the south in a winding course, entering the Province of Perugia (Umbria), where it passes through the valley between Perugia and Assisi. It receives the waters of many smaller streams, and at Orte, where it is joined by the Nera (the ancient *Nar*), it begins to form the boundary between the provinces of Umbria and Rome, encircling Mount Soracte and entering the Campagna Romana. About three miles above Rome it is swelled by the Anio (now Aniene or Teverone), then passes through the city of Rome, where it forms an island, the Insula Tiberina (now Isola di San Bartolommeo), and enters the Tyrrhenian Sea about twenty-six miles below.

The total length of the Tiber is 245 miles; its breadth at Rome is about 250 feet. It is a swift-running stream, carrying down an enormous amount of alluvial matter, which, in solution, gives the water that yellowish color for which the flavus Tiberis was renowned. The sediment deposited at the mouth of the Tiber is pushing out the land at the rate of about ten feet a year, so that the ruins of Ostia, the ancient harbor of Rome, are now more than four miles inland. The delta is formed of two mouths: the *fiumicino*, originally a channel dug by Trajan for his harbor (Portus Traiani), now the larger and navigable branch, and the *fiumara*, now almost choked by sand banks; and these inclose the Isola Sacra, a desolate and unhealthy island once sacred to Venus. The Tiber is navigable by small steamers as far as Rome, and by smaller craft as far as Orte, about sixty miles from its mouth. It is subject to frequent and often disastrous inundations, of which the ancient writers have recorded no less than twenty-three. Among the more famous floods are that mentioned by Horace (*Odes*, I. 2), that of 1598, when the water at Rome rose 51½ feet, and that of 1900, when it reached a flood-height of almost 54 feet. To remedy this evil, the Government, beginning in 1876, has constructed massive embankments at Rome, at the expense of more than $25,000,000; but already the carefully planned work has proved defective. The stream on the north of the Tiber island has become clogged with sand, and in the flood of 1900 fully a quarter of a mile of the south embankment was carried away by the water.

Consult: S. M. Smith, *The Tiber and Its Tributaries* (London, 1877); Narducci, *Saggio di Bibliografia del Tevere* (Rome, 1876).

TIBE'RIAS, Lake or Sea of. A lake in Palestine. See Gennesaret, Lake of.

TIBE'RIUS (Tiberius Claudius Nero Cæsar) (B.C. 42-A.D. 37). The second Emperor of Rome (A.D. 14-37). He was the son of Tiberius Claudius Nero and Livia Drusilla (q.v.), and was adopted by Augustus (q.v.) when he married Livia in B.C. 38, after her compulsory divorce. He was carefully educated, and early manifested intellectual power and military skill. His first important command was the expedition sent in B.C. 20 to restore Tigranes to the throne of Armenia. A more noteworthy commission was given him in B.C. 15, when, in company with his younger brother Drusus (q.v.), he defeated the Rhætians. Two years later he was consul with P. Quintilius Varus, and in B.C. 11 he fought successfully against the Dalmatians and Pannonians. The death of Drusus in B.C. 9 recalled Tiberius to Germany, but in B.C. 7 he held the consulship for the second time. The troubles which were to overshadow his life had, however, already begun. In B.C. 11 he had been forced by Augustus to divorce his wife, Vipsania Agrippina, whom he loved deeply, and to marry the Emperor's daughter Julia, the widow of Marcus Vipsanius Agrippa (q.v.). Her conduct, and perhaps his own jealousy of the growing favor of Gaius and Lucius Cæsar, the two grandsons of Augustus, children of Julia and Agrippa, led him to retire, against the Emperor's will, to Rhodes in B.C. 6, the very year in which the tribunician power was conferred upon him for five years. He remained in Rhodes seven years, and before his return Julia had been banished for life to the island of Pandataria. The death of Lucius Cæsar in A.D. 2 and of Gaius in 4 led Augustus to adopt Tiberius as his heir. From this time until the Emperor's death Tiberius was in command of the Roman armies, and campaign followed campaign. In 4 he reduced Germany from the Rhine to the Elbe, from 6 to 9 he waged war again in Dalmatia and Pannonia, and from 10 to 11 he held the Rhine against the Germans who had defeated Varus (q.v.). In 12 he was honored with a well-earned triumph.

When the death of Augustus occurred, August 19, 14, Tiberius was on his way to Illyricum. He was summoned home by his mother, and at once assumed control of the Empire. Despite his execution of Postumus Agrippa, the grandson of Augustus, his reign was at first beneficent. Gradually, however, a change took place in Tiberius. He minimized the power of the people, and transferred the election of magistrates from them to the senate. At the same time he watched with suspicion the increasing popularity of Germanicus Cæsar (q.v.), his nephew. In 19 Germanicus died, poisoned, if the reports current at the time may be believed, at the instigation of his uncle. About this time the evil genius of the reign of Tiberius, Ælius Sejanus (q.v.), gained his ascendency over the Emperor. Under his influence a system of espionage was instituted which doomed all who in any way opposed Tiberius. Freedom was abolished in Rome, the senate was demoralized, and the Emperor sank to the level of a cruel and ruthless tyrant. In 23 Sejanus abetted the murder of the only son of Tiberius, Drusus Cæsar (q.v.). Three years later the Emperor left Rome with Sejanus, going first to Campania and in 27 to Capri, where he remained till his death.

In 29 Livia Drusilla died, thus removing one of the last barriers to the complete degeneration of her son. Two years later Tiberius learned of the treachery and ambition of Sejanus, who was put to death, only to be replaced by Macro, as corrupt as his predecessor. In 37 Tiberius died, smothered, though already on his death-bed, by Macro, and was succeeded by Caligula (q.v.). The reign of Tiberius was beneficial to the Empire at large, and the provinces especially flourished under his sway. Only in Rome, and only where his personal interests were at stake, was he merciless.

The writings of Tiberius have been lost. His style is said to have been obscure, archaic, and affected. He wrote a brief autobiography, a lyric on the death of Lucius Cæsar, and a number of Greek poems.

Consult: Ihne, *Plea for the Emperor Tiberius* (London, 1853); Pasch, *Zur Kritik der Geschichte des Kaisers Tiberius* (Altenburg, 1866); Freytag, *Tiberius und Tacitus* (Berlin, 1870); Stahr, *Tiberius' Leben, Regierung, Charakter* (2d ed., ib., 1873); Tuxen, *Kejser Tiberius* (Copenhagen, 1896); Baring-Gould, *Tragedy of the Cæsars* (London, 1892).

TIBET, or **THIBET**, tĭb′et *or* tĭ-bĕt′. A region of Central Asia, forming part of the Chinese Empire. It is bordered on the north and east by Chinese territory, and on the west and south by Kashmir, Nepal, Bhutan, Sikkim, Assam, and Burma. Tibet is one of the least known parts of the world, foreign travel and exploration being forbidden in accordance with Chinese policy. There is some uncertainty even as to its exact boundaries and extent. Politically three distinct regions included within its wide limits must be eliminated: (1) 'Little Tibet,' between 74° and 79° east longitude, now included in Kashmir, and composed of Baltistan and Ladakh (qq.v.); (2) and (3) the two regions known as Ku-ku-nor and the Ts'aidam, or Ch'aidam, lying south of the Nan-shan, east of the Altin-tagh, and north of the curve formed by the eastern and southeastern extensions of the Kuen-lun system, bearing the names of Akka, Tolai, Angirtekshia, Barkhan-Bhōba, Shuga, etc.

Physical Features. Tibet presents two distinct physical divisions: (1) A region of lakes in the north, and (2) a region of rivers in the south and east. The first, occupying the greater portion of the western half of the country, is known as the Chang Tang or 'Northern Plain.' It is an arid treeless and shrubless solitude, with rounded hills and broad flat valleys between them, and a number of sharply defined mountain ridges rising several thousand feet above the plain. It has an average elevation of from 14,000 to 16,000 feet, falls away gradually to the east and south, and is dotted with lakes—mostly salt, some of them of considerable size. The more or less parallel mountain ridges, together with their separate valleys, lie buried beneath a vast accumulation of mountain débris, giving the surface the aspect of a plateau of uplift, or of one of tectonic construction. The streams terminate in salt lakes, which give unmistakable evidence of gradual desiccation. Large stretches toward the Kuen-lun are uninhabitable, and are abandoned to the wild beasts. In the southern zone, between the parallels of 32° and 33° north, a lofty range reaches as far east as 90° 25′—the Nin-chin Tang-la, the highest peak of which has an altitude of 24,153 feet, the Goring-la pass having an elevation of 19,587 feet. From 33° 50′ north toward the Kuen-lun there are ranges of extinct volcanoes with altitudes of 20,000 feet. One of the best known lakes of this region is the Pangong-tso, 13,930 feet above sea-level, partly in Ladakh (about latitude 34° north and longitude 79° east).

This inhospitable region is bordered on the east and south by the region of rivers, which is also a region of snow and ice-covered mountains and deep ravines. Its eastern section covers the whole eastern half of the country, stretching from about 90° east to China. It is almost entirely occupied by a succession of more or less wooded but lofty and steep mountains, with a general north to south trend, cut into deep narrow gorges, in which flow the rapid streams of melted snow which unite to form the upper courses of the great rivers which are known in their lower courses as the Hoang-ho, the Yang-tse-kiang, the Mekong, and the Salwin (qq.v.). The southern section of this river region lies to the south of the Chang-tang and extends from the Nin-chin Tang-la north of Lhasa, the capital, to the great South Chain, and is overlooked by Mount Everest, the highest peak of the Himalaya. Its mountains have a southeast and east trend, with many lateral intersecting ranges and spurs, which give direction to its numerous streams. In it are found the sources of three important rivers—the Indus and the Sutlej (qq.v), which rise in the Gang-ni or Kailas Mountains in the west and flow through India, and the Brahmaputra, which, under the name of Yaru-Tsangpo, rises farther east in the Mariam-la Mountains. The principal lakes of this region are the Sacred Manasarowar, near the sources of the Indus and the Sutlej, and 'Scorpion Lake,' the Yamdok or Palti, south of Lhasa, with a circuit of 45 miles. Here are found the bulk of the population, the seat of the government, and the great centres of culture and refinement.

Climate. The climate is extremely severe. It is dry owing to the shutting out of the moisture-carrying clouds from the south by the great South Chain of the Himalayas. There are sometimes, however, heavy downpours of rain. Bower, who crossed the country between 32° and 34° north latitude, found the temperature in June to range from 18° to 34° F.; in July, from 17° to 30°; in August, from 19° to 35°; in September, from 19° to 36°; in October, from 15° below zero to 21° above; in November, at the decreased elevation of Eastern Tibet, from 15° below to 21° above; and in December, at a still lower level (9000 to 8154 feet), from 1° to 14° above zero.

Flora. It has been estimated that not more than one-twentieth of the surface of Tibet is covered with vegetation. It has been fairly well settled that the flora, so far as the northern and eastern sections are concerned, belongs to the Arctic Alpine division of the great northern region. Toward the south it approaches that of India; and in parts the vegetation is luxuriant.

Fauna. This includes the wild yak (*Poëphagus grunniens*), antelope, gazelle, kyang or wild ass (*Equus hemionus*), nyang or mountain sheep, *Ovis ammon* (found above an elevation of 15,000 feet), wolf, fox, wild dog, bear (regarded by the natives with dread as the primitive speechless wild man and hence unmolested), musk deer, and hare. In game-birds—especially in Eastern Tibet—there are the sand-grouse, several species of pheasant, ducks, teal, the bar-headed goose, coolen, etc. Toward the south the fauna is more Indian in character, and includes the lynx, leopard, tiger, etc. Among the domestic animals are the cat and the dog, but no fowls. Nor are song-birds found, except as strays from passing flocks.

Mineral Resources. Shut in as Tibet is, both politically and physically, little is as yet known of its geology. It is, however, supposed to be rich in minerals, and gold, silver, iron, and coal are mentioned. Gold-washing is a common occupation in some parts and small quantities of gold-dust are exported; but mining is prohibited. The gold-fields lie in the district known as Thok Jolang, in the southwestern part of the Chang-tang, and there Littledale found mining operations carried on six months of the year, exclusively by Lhasa people. Lapis lazuli and other semi-precious stones, as well as gems, are extensively used for personal adornment by both sexes, and it is supposed the country must be rich in these. The Kuen-lun Mountains have for many centuries been the chief source of the jade supplies of China, and in Europe and America fine specimens of heliotrope jadeite are shown reputedly of Tibetan origin; but the true provenance of the specimens is not known.

Agriculture. Farming and the tending of flocks and herds are the chief occupations, but, owing to the elevated and rugged nature of the country, both are attended with many hardships. The entire Chang-tang is uncultivable, and it is only at elevations less than 13,500 feet that the growing of barley—the hardiest of all the cereals, and the chief article of food in Tibet—becomes possible. The other crops are wheat, buckwheat, cabbages, potatoes, turnips, radishes, and pulse, and among the fruits, apples, apricots (especially in the western province), and peaches, and in the south pomegranates and jujubes. A little rice is produced in the south, but the main supply is imported.

Industries. Tibet has no factories, but many minor industries are carried on in the settled districts, and the people are reputed to be skillful weavers, potters, and metal-workers. Dergé in Eastern Tibet is noted for its swords, guns, teapots, tinder-boxes, and bells, as well as for its saddlery. An excellent kind of serge called *pulo* is produced everywhere.

Commerce. The chief products of Tibet are wool, lambskins, lynx, fox, leopard, and other skins, yak-tails, used in India as chowries or fly-flaps, deers' horns, musk, rhubarb, gold-dust, precious stones, borax, nitre, salt, and live stock. Much of the wool goes to Kashmir to be manufactured into the famous Kashmir shawls. In exchange for these, Tibet receives tea, cotton and cotton goods, silk, sugar, and tobacco from both China and India: satins, gold brocades, red leather, chinaware, gun-barrels, hardware, drugs, and flour from China; leather and saddles from Mongolia; broadcloth, indigo, spices, coral-beads, and pearls from India; rice from Sikkim; and saffron from Kashmir. Tibetans are great consumers of tea, and it has been estimated that over 13,000,000 pounds of brick tea are received annually from China alone. The preferred medium of exchange is the Indian rupee, but much of the business of the country is mere barter.

Transportation and Communication. Lhasa, the capital, is the great central mart, from which trade routes radiate in all directions: to China by way of Chiamdo, Bat'ang, Li-t'ang, and Darchendo, in Eastern Tibet; northeast through the Ts'aidam and Ku-ku-nor to Kan-su and Mongolia; westward to Gartok in the Province of Nari on the borders of Kashmir, where a great market is held in August and September; northwest to Rudock, a frontier post, the emporium for the trade with Leh. Another trail leads through Gyantse, Khamba-jong, and the recently opened British-Tibetan mart Yatung (q.v.) to Kalimpong and Darjiling in Sikkim; another leads through Shigatse to Bhutan, or through Iilam on the southwest to Nepal. Transportation is difficult and tedious, most of these journeys requiring months to complete. Robbers are numerous and bold, hence traders travel in large companies; the pack-animals are yaks, mules, ponies, and where the road is too stony for the yak, sheep are used, one sheep carrying 25 to 30 pounds. Food, fodder, and tents must be carried; the passes are precipitous and frequently blocked with snow. The animals are never housed by the way, and the mortality among them is very great. In the settled parts of the country the streams are usually bridged, or if unfordable they can be crossed in round wicker-work boats covered with skins, the animals swimming.

Government. For administrative purposes the territory, subject to the Lhasa Government, represents 4 provinces (Nari, Tsang, Wu, and Khams), and is divided into 53 jongs or prefectures and 123 sub-jongs. At the head of each jong are two jongpons of equal rank, one a lay-man, and one a lama, with civil, military, and judicial jurisdiction. Under these are the local magistrates, headmen, and elders. Over all is the Amban or Imperial Minister Resident at Lhasa, who is the intermediary between the local Government and Peking. He is charged with the supervision of the foreign relations of the country, and settles all difficulties which may arise between the tribes. Taxes are paid in kind. The regular army consists of 9000 men, 3000 of whom are usually at home on half pay. A militia force of 65,000 can be called out at any time.

POPULATION. Judging from a partial census taken in 1737, and the statements of travelers since then, it is safe to assert that within the bounds given in this article to Tibet the population does not exceed 3,500,000, of whom at least 500,000 are lamas; in 1737 there were 316,200 in Wu-Tsang alone. Many influences are at work to keep down the population, among which may be mentioned the absence of immigration, the prevalence of polyandry and of celibacy among the lamaists, and the ravages of smallpox, which is always epidemic, and carries off vast numbers every year.

RELIGION. Bön, the indigenous religion of the country, is a kind of Shamanism (q.v.). It still has many adherents, especially in Eastern Tibet; but the State religion, and the prevailing one, is the corrupt form of Buddhism called Lamaism (q.v.). There are several sects, but the most powerful is the Gelugpa, which constitutes the established Church. (See TSONG-K'A-PA.) Followers of this sect wear yellow caps as distinct from the unreformed Nyingmepas, who wear red caps, and are the next most powerful sect. The lamas or monks are very numerous, dwell in great monasteries, frequently called lamaseries, of which there are said to be over 3000, some of them of immense size, having accommodation for from 3000 to 10,000 persons. They are commonly considered to be repositories of great wealth. Education is chiefly in the hands of the lamas.

ETHNOLOGY. Judged by their language alone, Tibetans proper belong to the Tibeto-Indo-Chinese branch of Keane's *Homo Mongolicus*. Physically, however, they exhibit marked variations, there being present at least two types—one Mongoloid, the other a somewhat slender figure, thin, prominent, often aquiline nose, straight eyes, and long, sometimes wavy, hair. In the permanently settled portions of the country, where centres of population have existed for centuries, the people have varied considerably from the original type, the result being a mixed race, becoming more Chinese as one goes toward China, or more Indian (Nepalese or Kashmiri) as one travels southward or westward. This mixture is in part due to the concubinage of native women with foreign traders, soldiers, pilgrims, officials, etc., and in part to the system of polyandry. Monogamy prevails among the nomads, but elsewhere polyandry is common, one woman becoming the wife of the brothers of a family, the oldest being considered the father of all the children, the others being regarded merely as 'uncles.' There is also some polygamy among the wealthy, as in China.

HISTORY. The early history of Tibet is legendary and obscure. In the middle of the eighth century Tibet extended from Ku-ku-nor and Ladakh on the north into India in the south, while on the east the tribesmen came into frequent conflict with China, and it is recorded that they even entered Chang-an, the capital, in 763. In 747 the famous Indian wizard and teacher, Padma-sambhava, had arrived; he made a long missionary journey through the country, everywhere vanquishing the Shamanistic devils, and laid the foundation of Lamaism. In 749 the first monastery was built. Muni-tsanpo came to the throne in 789. In order to better the condition of the poor, he compelled the rich to share their wealth with the indigent. This leveling process was unsuccessful. Lang-dharma, who died in 899, left only minor sons; the kingdom was broken up into two, later into a number of petty principalities, and it was easy for Genghis Khan to incorporate Tibet into his empire in 1206.

Kublai Khan, the conqueror of China, actively promoted the spread of Buddhism throughout the Mongol Empire. Buddhism having entered from India and China in the first half of the seventh century, the language was reduced to writing, the translation of the sacred books was begun, and about 650 the first temple—the Labrang, at Lhasa—was erected. From this time forth the internal history of Tibet is the history of the struggle of Buddhism (already corrupt) with the indigenous Shamanism (q.v.), the rise and development of Lamaism (q.v.) and the Lamaistic hierarchy, the abolition of the kingly dignity and the establishment of the supremacy of the Grand Lama at Lhasa as the head of both Church and State. In 1270 he made the chief of the Sakya sect head of the Church, and conferred on him the temporal power. Near the end of the fourteenth century arose Tsong-k'a-pa (q.v.), the great reformer, through whose efforts Lamaism was purified somewhat, and a new and powerful sect, the Gelugpa, was founded. In 1642 Kushri Khan, the Mongol Prince of Ku-ku-nor, conquered Tibet, and in 1645 made over the sovereignty of it to the Grand Lama of the time, with the title of Dalai (or Talé) Lama. He has continued ever since to be both the head of the State and the head of the Church, the Chinese Empire having confirmed him in both offices in 1650. In 1717 the Sungars invaded the country, but were driven out by Chinese armies in 1720, when Eastern Tibet was placed under the direct rule of Chinese officials, a Kansu and Sge-chuer. In 1774 Warren Hastings sent from India an envoy to negotiate friendly commercial relations between Tibet and the British East India Company. He was well received. Another embassy was sent under Turner in 1783, but his efforts were made futile by the policy of the company under the administration of Lord Cornwallis, who, under treaty engagements with Nepal, assisted the Gurkhas when in 1790 they invaded Tibet and plundered Tashilunpo. They were driven out in 1792, and since then the passes between India and Tibet have been closed. In 1893 a convention was signed opening Yatung (q.v.) on the Tibetan frontier as a British trade-mart. The list of Europeans who have entered Tibet in more recent times comprises Bagle in 1774; Turner in 1783; Manning in

1811; Huc and Gabet in 1846; Przhevalski in 1870-71, 1879, and 1887; Rockhill in 1889 and 1891-92; Bonvolot in 1889; Bower in 1890-91; Littledale, 1894; Sven Hedin during his journeys of 1894-97 and 1899-1902; Miss Taylor, and a few others. Many 'pundits,' trained by the great Trigonometrical Survey of India, have frequently traversed it and have procured much valuable information regarding the country. Much of it, however, is 'confidential,' and is still unpublished.

Bibliography. Desgodins, *Le Tibet* (2d ed., Paris, 1885); Rockhill, *The Land of the Lamas* (New York, 1891); id., *Diary of a Journey Through Mongolia and Tibet* (Washington, 1894); id., *Notes on the Ethnology of Tibet* (ib., 1895); id., *A Journey to Lhasa and Central Tibet* (New York, 1902); Bower, *Diary of a Journey Across Tibet* (London, 1894); Carey, *Adventures in Tibet*, with Miss Taylor's Diary (Boston, 1901); Waddell, *The Buddhism of Tibet* (London, 1895); id., *Among the Himalayas* (ib., 1899; Reijnhart, *With the Tibetans* (ib., 1901); Hedin, *Central Asia and Tibet* (New York, 1903); Jäschke, *Tibetan Grammar* (2d ed., London, 1881); Sandberg, *Handbook of Colloquial Tibetan* (Calcutta, 1894); Jäschke, *Tibetan-English Dictionary* (London, 1881); *Dictionnaire Thibétain-latin-français* (Hong Kong, 1899).

TIB'IA (Lat. shin-bone). In anatomy, the larger of the two bones forming the leg, and the one to which the fibula is attached. It articulates with the femur above and with the astragalus below. The tibia was the name of the commonest musical instrument of the Greeks and Romans. It was a pipe or flute, originally made of bone, but later of a reed, with the opening at the top, protected by a natural knot, with a tongue beneath, partially detached by a longitudinal slit. It was used at festivals, sacrifices, and dances, as an accompaniment to the rowing of the trireme, sometimes also to the march of troops to battle. The *tibia dextra* was the bass instrument and was held in the right hand, the *tibia sinistra*, or treble instrument, in the left. The *tibiæ pares* were both treble or both bass, and the *tibiæ impares* were one bass and one treble.

TIBUL'LUS, Albius (c.54-c.19 b.c.). A Roman elegiac poet, born of an equestrian family. He inherited an estate at Pedum, between Tibur and Præneste, which had been either wholly or partially confiscated in the civil wars. Tibullus, however, recovered part of his property, and spent there the best part of his short life. He was patronized by Messala, whom in 31 he accompanied into Aquitania, to suppress a serious revolt. He was present at the battle of Atax, which gave the final blow to the insurgents; and he celebrates in a fine strain of poetry the honorable part he bore in the campaign. Next year Messala was sent to the East and again Tibullus accompanied him; but having been obliged from illness to stop at Corcyra, he returned to Rome. Henceforth he devoted himself to the study and composition of poetry. His Elegies, divided into four books, are mainly addressed to his mistresses, Delia, Nemesis, and Glycera, whose inconstancy or coldness he bewails in tender and exquisitely finished verses. The third book, however, is now believed to be the work, not of Tibullus, but of another and inferior poet; while the hexameter poem on Messala, with which the fourth book opens, is supposed to be also by another. The character of Tibullus was singularly pure, amiable, and winning. During life he had the honor of being addressed in an ode and epistle by Horace; after death, of being bewailed in an elegy of matchless beauty by Ovid. The best editions are those of Baehrens (Leipzig, 1878), Hiller (ib., 1885)), and Müller (ib., 1885). The poems were translated into English by Grainger (1752) and Cranstoun (1872), and into English prose by Kelly (1854). Consult Sellar, *Roman Poets of the Republic* (London, 1863).

TICAO, tē-kä'ō. An island belonging to the Philippine Province of Masbate (q.v.).

TIC-DOULOUREUX, tĭk do͞o'lo͞o'ro͞o', *Fr. pron.* -rē. See Facial Neuralgia.

TICH'BORNE TRIAL. A celebrated trial in which an impostor attempted to obtain possession of the Tichborne estates in Hampshire and Dorsetshire, England, by assuming to be the heir, Roger Charles Tichborne. The case was remarkable for the great public interest it aroused, for the length and thoroughness of the trial, and for the success of the impostor in deceiving a great number of intelligent persons. Roger Charles Tichborne was born in 1829, and after some education in France, and at the Roman Catholic College at Stonyhurst, England, entered the British Army. His French accent and his eccentricities made him unpopular and he resigned and went to Brazil. He sailed from Rio de Janeiro in 1854 in the ship *Bella*, which was lost at sea with all on board. His father, Sir James Tichborne, died in 1862, and as Roger was supposed to be dead, a younger son, Alfred, succeeded to the estates. Lady Tichborne refused to believe that her son, Roger Charles, was dead, and advertised extensively for information regarding his whereabouts. In 1865 a coarse, ignorant butcher named Arthur Orton, who resided at Wagga Wagga, Queensland, Australia, under the name of Thomas Castro, conceived the idea of representing himself to be Roger Charles Tichborne and claiming the estates. His first step was to write a letter to Lady Tichborne claiming to be her son. The letter was illiterate and contained statements as to his identification which were wholly false and inapplicable to the true heir. He subsequently came to England, went over the Tichborne estates, gained all the information he could as to the former life and habits of Roger Charles, and succeeded in convincing the family solicitor and several others of his identity. In January, 1866, he called on Lady Tichborne in Paris and was received as her son. This was most remarkable, as there was no similarity in the appearance of Orton and Roger Charles, and Orton had no knowledge of the French language, in which the true heir was proficient. After this recognition he had great success in gaining adherents to his cause. The Tichborne family, however, repudiated him, and at a large expense investigated his life, discovering his true name and past life. He succeeded in raising large sums of money by issuing bonds, payable upon his obtaining possession of the property. These were known as the 'Tichborne bonds' and were widely distributed. He brought ejectment suits to recover the estates in 1871, and succeeded in inducing over 100 witnesses to swear that they recognized him or believed him to be

Roger Charles. Despite his ignorance, he exhibited remarkable shrewdness and cunning at the trial, which lasted 103 days and ended in his being nonsuited. In 1873 he was tried for perjury, being defended by Edward Keneally, and after a trial of 188 days he was convicted, and sentenced to fourteen years' penal servitude. He was released in 1884, and again attempted to stir up public sentiment in his favor, but was unsuccessful. The cost of the two trials has been estimated at £200,000. He died in abject poverty in 1898. Consult: *The Tichborne Romance* (Manchester, England, 1871); *Charge of Lord Chief Justice of England in the Case of Queen vs. Thomas Castro* (London, 1874).

TICINO, tē-chē'nō. A river of Switzerland and Northern Italy (Map: Switzerland, C 2). It rises on the southern slope of the Saint Gotthard, and flows south and southeast, traversing Lago Maggiore, and emptying into the Po after passing the city of Pavia. Its length is 154 miles. Its upper course is a wild mountain torrent flowing through romantic gorges, but below the lake it is navigable and communicates with several canals.

TICINO (Ger. *Tessin*). A southern canton of Switzerland, bordering on Italy, between Valais on the west and Grisons on the east. Area, 1088 square miles (Map: Switzerland, C 2). It has a very mountainous surface intersected by the valleys of the Ticino, Maggia, Moesa, and of a few other streams. In the north rise the Lepontine Alps with the Saint Gotthard, in the east are the Adula Alps, while the southern part around Lago Maggiore is comparatively low, and is the most fertile part of the canton. Notwithstanding its mountainous character, Ticino has two-thirds of its area under cultivation. Cereals are the chief products, but southern fruits and grapes are also cultivated on a large scale. The manufacturing industries are undeveloped and native artisans emigrate annually to other parts of Europe. The chief means of transportation is the Saint Gotthard Railway. The Constitution (as amended in 1892) provides for a Legislative Assembly elected by the people on the basis of proportional representation, and an Executive Council, also elected by the people. The optional referendum prevails. Population, in 1888, 126,751; in 1900, 138,638, almost exclusively Italians. Capital, Bellinzona (q.v.). Consult Motta, *Bibliografia storica ticinese* (Zurich).

Ticino as part of Gallia Cisalpina was early joined to the Roman Republic. After the decline of the Roman power it passed successively into the hands of the Ostrogoths, Lombards, and Franks. During the later mediæval period its territory formed a portion of the Duchy of Milan, from which it was wrested in successive conquests during the fifteenth and sixteenth centuries by the members of the Swiss Confederacy, whose title was confirmed by the 'Eternal Peace' of 1516. The attempt to establish Protestantism in the District of Locarno was rigorously stamped out by the exile of members of that faith in 1555. The rule of the Italian district by the other members of the Confederacy was harsh, but only one rebellion, in 1755, marked its course. In 1798 this district, divided into the cantons of Bellinzona and Lugano, was constituted part of the Helvetic Republic; in 1803 they were united into one canton—Ticino—which received greater privileges as a full member of the Confederacy. Other difficulties were removed by the Constitution of 1830, but measures of a religious and commercial nature have often separated the inhabitants from the sympathy of their northern neighbors, and local struggles of Radical and Ultramontane parties have often necessitated Federal interference.

TICK (AS. *ticia*, miswritten for *tiica*, *tica*, Ger. *Zecke*, tick; connected with Arm. *tiz*, tick). One of those members of the order Acarina which belong to the families Argasidæ and Ixodidæ, which have been grouped together in the superfamily Ixodoidea. The ticks or 'louse-flies' are eight-legged creatures in which the cephalothorax is coalesced with the abdomen. The young, newly hatched individual is flat and nearly circular and has only six legs. With the first molt it enters the second or nymphal stage, which is characterized by the presence of a fourth pair of legs. After the second molt it becomes mature. In the free-living state the body of a mature tick is flattened dorsally and is of an oval shape. The body is covered with a leathery integument which generally assumes on the dorsal surface a hardened, chitinous, more or less smooth, and darker appearance. Near the margin it is impressed by a depressed line leaving a distinct rim around the body.

All ticks, so far as known, although found upon plants in their early stages, are parasites of animals. The young seek on every possible occasion to fasten themselves to vertebrate animals. Mammals and birds seem to be preferred, and spots where the skin is soft are chosen. When the very young first fasten themselves they cannot penetrate deeply enough to draw blood, but the irritation causes a suppuration on which they feed. When, however, they have grown sufficiently to enable them to reach a blood-vessel, the small, flat, semitransparent creatures soon become distended, the body becomes rounded, and the color frequently becomes dark red. In a week or more the larva is transformed into the nymph, which at the expiration of another week is changed to a mature individual. The female only sucks blood, so far as is known. The male retains its form and size, and although it attaches itself to warm-blooded animals, it evidently does so only for the purpose of seeking the female.

Several species occur in the United States. The common dog tick or wood tick (*Dermacentor electus*) is found frequently in the woods in the Northern States. The common tick occurring upon the ground-squirrel in the Mississippi Valley is *Ixodes ricinus*. *Argas miniatus* is very destructive to chickens in parts of Texas and Florida, and *Argas reflexus*, the pigeon tick, is common in pigeon-houses in both Europe and the Southern United States. This species is capable of living an almost incredible length of time without food. In Persia a species, the miana-bug (*Argas Persicæ*), lives in houses and seeks its human prey at night; its bite causes serious disturbance, and is said even to cause death. In South America a species known as 'garapate' (*Amblyomma Americanum*) occurs in dry, bushy places, where it clings to twigs and transfers itself to passing horses or cattle as opportunity occurs. It also lives in the United States and has been found on human beings. Eight species of ticks in the United States have been found upon cattle, one associated with the Texas cattle fever (*Boöphilus annulatus*) being the most noted and the most destructive. Other species of the same genus transmit the same or similar diseases of cattle in other parts of the world. *Boöphilus australis* transmits what is probably the same disease in Australia, and *Boöphilus decoloratus* (the so-called 'blue tick') acts the same way in South Africa, carrying the disease commonly known as 'red water.'

Texas cattle fever is particularly destructive to Northern cattle that have been shipped south or that have been brought into contact with Southern infested cattle which have been shipped north. The dipping of cattle in vats containing cottonseed oil or any one of several mixtures, known as 'cattle dips,' destroys the ticks.

Certain mites of the family Gamasidæ are sometimes known as ticks, although the name in this application is erroneous. The bird tick (*Dermanyssus avium*) is a familiar parasite of caged birds. The poultry tick (*Dermanyssus gallinæ*), which is also known as the 'little chicken mite,' gathers on fowls in the hennery, especially at night, and sucks their blood. Certain of the true insects are also erroneously called ticks. For example, the flies of the family Hippoboscidæ are quite generally known as bird ticks. (See FOREST FLY and PUPIPARA.) The degraded wingless flies of the family Nycteribiidæ are called bat ticks.

Consult: Osborn, *Insects Affecting Domestic Animals* (United States Department of Agriculture, Washington, 1896); Salmon and Stiles, *Cattle Ticks of the United States* (ib., 1902); Marx, "Classification of the Ixodidæ," in *Proceedings Entomological Society of Washington*, vol. ii., No. 2 (1892); Marx, "The Morphology of the Ticks," id., vol. ii., No. 3 (1892).

TICK'ELL, THOMAS (1686-1740). An English poet, born at Bridekirk, in Cumberland. He was educated at Queen's College, Oxford, of which he became fellow (1710-26). He attracted the attention of Addison by some lines praising the latter's *Rosamond;* and Addison, on becoming Secretary of State in 1717, made him Under-Secretary. He was secretary to the Lords Justices of Ireland from 1725 till his death. He published *Prospect of Peace* (1712); *The Royal Progress* (1714); and a poetical version of the first book of the *Iliad* (1715), out of which grew the famous quarrel between Pope (q.v.) and Addison (q.v.). His best known poem is *Colin and Lucy;* the longest is *Kensington Gardens*. Goldsmith calls his *Elegy on Addison* (prefixed to Addison's *Works*, 1721), "one of the finest odes in our language." Consult Dr. Johnson's *Lives of the Poets* (London, 1854, 1890, etc.).

TICKET (OF. *estiquette*, *etiquette*, Fr. *étiquette*, ticket, label, etiquette, from OHG. *stehhan*, Ger. *stechen*, to stick; connected with Lat. *in-stigare*, to prick, incite, Gk. *στίγμα*, *stigma*, mark, brand, puncture, Skt. *tij*, to be sharp). A slip of paper containing a statement or certificate that the person to whom it is issued, or the holder, is entitled to some right or privilege therein referred to or described, as railroad tickets, theatre tickets, pawn tickets, and lottery tickets. A ticket is evidence of a contract between the holder of the ticket and the person or corporation issuing it. Usually tickets do not purport to express the entire contract between the parties, and the terms or conditions which are not expressed may be supplied by parol evidence (q.v.). Where the ticket grants the right or privilege of using the grantor's real estate, as in case of theatre tickets, the holder of the ticket acquires no title or interest in the real estate, but becomes a mere licensee (see LICENSE) entitled to use the real estate in the manner and for the purposes specified. The licensor or grantor of the ticket, however, may at will revoke the license, even though such a revocation is a breach of the contract; and upon such revocation the holder of the ticket becomes a mere trespasser and may be summarily ejected, but only necessary force can lawfully be used for that purpose. He may, however, be entitled to recover damages for breach of the contract in ejecting him. See THEATRE.

This rule does not apply in the case of tickets issued by common carriers, who, by virtue of their public calling, are compelled to accept for carriage all who pay a reasonable fare and comply with their reasonable rules and regulations. Passenger tickets under ordinary circumstances are generally now held to be contracts, and not mere symbols or means of identification of the passenger, so that the holder of a ticket is deemed to assent to its terms. Such stipulations, which usually restrict the liability of the carrier, have been held to be valid and binding if reasonable and not against public policy. Common carriers may require passengers to buy tickets as a condition of their being carried; and, when reasonable opportunity to do so is given, the carrier may charge an additional rate when the passenger has failed to buy a ticket. Common carriers may make any condition as to the time and use of tickets which is reasonable. Thus provisions contained in the ticket that it shall be used before a date named, or that it shall be stamped by the carrier before it is presented for a return trip, or that it shall not be transferable, have been held to be valid.

The carrier may require the passenger to produce the ticket or an identification check for inspection whenever required to do so, and upon the passenger's failure to comply with the regulation may eject him. This appears to be the general rule even when the passenger's inability to comply with the regulation is due to the neglect of the carrier's agents, as when the wrong ticket is given out by the carrier's ticket agent or the wrong coupon is taken up by one conductor, so that the passenger is left without the proper coupon at a subsequent stage of his journey. The passenger's right in such a case is not to insist upon being carried without payment of the fare demanded by the conductor or other agent of the carrier, but to pay the fare demanded and to bring an action against the carrier for breach of the contract evidenced by the ticket. Purchase of a ticket entitles the holder to all the accommodations usually given by the carrier to holders of that class of tickets. If, however, they are not provided, as in case the carrier fails without excuse to provide the passenger with a seat, his right is not to refuse to pay fare or surrender his ticket, but to recover damages for the carrier's breach of contract or undertaking to carry. See CARRIER, COMMON; TRANSPORTATION; etc.

TICKET OF LEAVE. In Great Britain and its Australian colonies, a kind of permit or license granting a prisoner his liberty for good conduct, and revocable for subsequent misconduct, under the terms of its conditions. The term was first applied to the license of liberty granted to convicts in Van Diemen's Land as a part of the reform in prison methods in 1840, and later to those who were granted a similar license in England as a partial compensation for their long term of imprisonment after transportation had been discontinued, but the terms of sentence had not been shortened. These convicts became so numerous, and the number of crimes committed by them became so serious, that a still further reform led to the system of granting the license upon the mark system, under which it was given only to convicts sentenced for terms longer than two years, and who by their work and industry, as shown by their marks, became entitled to it. Under this system the ticket of leave has been found to work well, its chief defect being the drawback put upon the prisoner's chance of success in obtaining work and living among reputable people by his liability to constant surveillance by the police officials. This defect is largely removed by the existence of various private charitable institutions which look after the prisoners who place themselves under their charge in such a manner as to remove the publicity of their being watched. The prisoner is practically free to come and go as he chooses within a certain district, under certain conditions of living an honest industrious life among honest people, and making periodical reports.

The effectiveness of such a system of rewarding good conduct on the part of prisoners, and inducing them to live honest lives without imprisonment, but yet where their conduct is subject to control, has become so generally recognized in the United States that similar acts have been passed in about half of them, the license being generally called a 'parole.' Most of these acts have been passed since 1890, and under none of them can a parole be granted to a person convicted of murder in either the first or second degree; and most of them refuse it to a prisoner serving under a second conviction of crime. Of course the prisoners themselves are found to favor the granting of paroles; and the better element among them are in favor of the honest and strict enforcement of the conditions of surveillance.

Consult the works referred to under PENOLOGY; PRISONS; and also the *Report* of J. Franklin Fort to the American Bar Association in 1898.

TICK'NOR, FRANCIS ORRERY (1822-74). An American poet, born in Baldwin County, Ga. He studied medicine in the North and practiced his profession at Columbus, Ga. A small volume of miscellaneous verses was published in 1879. Two poems of Ticknor's are well known and rank among the best lyrics produced in the South. They are the pathetic "Little Giffen" and the stirring "Virginians of the Valley."

TICKNOR, GEORGE (1791-1871). An American literary critic and historian, born in Boston. Educated in a scholarly home, a graduate of Dartmouth (1807), admitted to the Boston bar in 1813, he gave up the legal profession for literature, went to Europe in 1815, studied four years at Göttingen and in other Continental cities, and returned in 1819 with a valuable library to a professorship of modern languages and literature in Harvard College. Here he devoted himself especially to French and Spanish, and attracted hearers beyond the university circle. He resigned his professorship in 1835, passed three years in Europe and eleven further years in elaborating his greatest work, *History of Spanish Literature* (1849), which was translated into German and Spanish and came to be regarded as a standard work, even in Spain. It was reissued in 1854, and again reëdited and enlarged in 1863. A fourth edition embodies his latest revisions. He published also a *Life of William Hickling Prescott* (1864) and several minor works. His *Life, Letters, and Journals* are collected in two volumes (1876). Other letters describing his life as a German student may be found in W. P. Trent's *English Culture in Virginia* (Johns Hopkins University Studies). His library, containing one of the best collections of Spanish literature in existence, was bequeathed to the Boston Public Library. As an educator Ticknor was in advance of his generation; as a citizen he represented the best traditions of Boston; as a scholar he held his own with the erudite men of his day. His greatest work, however, does not in its style represent the personality of the man so much as it does the conscientiousness of the scholar, and it is slowly losing its prestige.

TICKNOR, WILLIAM DAVIS (1810-64). An American publisher, born at Lebanon, N. H. He founded at Boston, in 1828, the publishing firm of Ticknor & Fields, afterwards known as Ticknor & Co. In addition to the works of Longfellow, Holmes, Saxe, Whittier, and Lowell, he published the *Atlantic Monthly* and *North American Review*, and made his office the resort of the leading literary men of his time. Mr. Ticknor was among the first American publishers to pay foreign authors for their work.

TICON'DERO'GA. A village in Essex County, N. Y., 100 miles north by east of Albany; on the stream which conveys the waters of Lake George into Lake Champlain, and on the Delaware and Hudson and other railroads (Map: New York, G 2). It is rich in reminiscences of the Colonial and Revolutionary periods. The vicinity is noted for its extensive production of crystalline graphite, furnishing the greater part of the total output of the United States. The water power afforded by the falls is utilized by several industrial establishments. Paper, wood pulp, and lumber products constitute the leading manufactures. Population, in 1890, 2267; in 1900, 1911.

In 1755 the French, recognizing the strategic value of the promontory, built a fort here and called it Fort Carillon (chime of bells), in allusion to the pleasing sound of the waterfalls near by. Several years later the present name was adopted. In 1757 Montcalm assembled here a force of 9000 men, with which he took Fort William Henry, on Lake George. On July 8, 1758, General Abercrombie, with 15,000 men, stormed Fort Carillon, but was repulsed with a loss of 2000, Viscount George A. Howe being among the killed. In 1759 General Amherst with a force of 12,000 men invested it, and the French, being too weak to withstand an attack, dismantled and abandoned both this fort and Crown Point, which were then enlarged and strengthened by the English. Being weakly garrisoned after the cession of Canada to Great Britain, Ticonderoga was surprised and captured on May 10, 1775, by Ethan Allen. On June 30, 1777, Burgoyne invested it, and on July 5, by placing a battery on Mount Defiance, a higher point, then called Sugar Loaf Hill, he forced the garrison to evacuate the place. Later in the year General Lincoln attacked the British here and captured Mount Defiance, releasing 100 American prisoners and taking 293 of the English, but he failed to recover the fort itself. After Burgoyne surrendered at Saratoga, the English garrison was removed and the fort dismantled, though in 1780 another English force under General Haldimand was stationed here for a time. After the war the fort gradually fell in ruins.

TIC-POLONGA. See Daboia and Colored Plate under Snake.

TICUNA, tē-kōō'nȧ, or Tucuna. A wild tribe of uncertain affinity inhabiting the forests of the Upper Amazon (Marañon) about the confluence of the Javary, on the Brazil-Peru frontier. They go perfectly naked, excepting for necklaces of monkey teeth and armlets of feathers, and depend for a living upon hunting and fishing. Physically they are well formed, and rather slender, with a dark complexion and a gentle expression. In disposition they are honest and direct. They bury their dead in great earthen jars, with their face turned toward the rising sun, and weapons and fruit placed upon the bosom. They have interesting masked dances and curious ceremonies at the naming of children. Jesuit missions were established between 1683 and 1727.

TIDAL WAVE. A term erroneously applied to almost any unexpected wave that inundates the seacoast or the shore of a great lake. These waves are rarely, if ever, due to the tides, since the tidal wave is a phenomenon admitting of exact calculation and prediction; on the other hand, they may usually be traced to some distant earthquake or violent storm. See Earthquake.

TIDEMAND, tē'dȧ-män, Adolf (1814-76). A Norwegian genre painter, born at Mandal. He studied at the Academy of Copenhagen and under Theodor Hildebrandt and Schadow at Düsseldorf, whence he went to Munich and later to Rome. Afterwards he usually spent the summer in Norway and the winter at Düsseldorf, where Scandinavian artists congregated around him and Gude. Besides the large historical compositions "Gustavus Vasa Addressing the Dalecarlians" (1841) and "Devotional Meeting of the Haugainer" (gold medal, 1848, National Gallery, Christiania, and Düsseldorf Gallery), he painted many genre subjects, remarkable for masterly conception and vigorous coloring, such as the cycle of ten pictures illustrating "Norwegian Peasant Life" (1850, Château of Oscarshall, near Christiania); "Summer Evening on a Lake" (1851, National Gallery, Berlin); "The Wolf-Hunter's Tale" (1853) and "A Funeral in Norway" (1854, both in the Ravené Gallery, ib.); "Grandmother's Bridal Crown" (1865, Karlsruhe Gallery), and others. He died at Christiania.

TIDES (AS. *tīd*, OHG. *zīt*, Ger. *Zeit*, time; connected with Skt. *a-diti*, boundless, and ultimately with Eng. *time*). The daily rising and falling of the waters of the ocean. When the water has reached the highest point it is called *high water*, and at its lowest point *low water*. The rising of the water is called *flood*, the falling *ebb*. Tides are caused by the gravitational attraction or pull of the sun and moon upon the water, and upon the earth itself. The moon, being so much nearer than the sun, is of course the principal cause. When the moon is directly over a given place it pulls the water under it, and thus tends to heap up a tidal wave just under the moon. At the same time it is pulling the earth itself; but it pulls the water more than the earth underneath, simply because the moon is nearer to the water on the surface than it is to the solid earth behind it. For we must remember that, according to Newton's law of attraction, the pull decreases rapidly when the body pulled is removed to a greater distance. But this reason also makes the attraction exerted upon the solid earth greater than that affecting the mass of water upon the side of the earth opposite to the moon. This water, being still farther away than is the solid earth, gets the least pull of all. The earth is, so to speak, pulled away from that part of the ocean that is opposite the moon, instead of directly under it. This causes another distinct heaping up of water opposite the moon, giving us a second tidal wave. There should be, therefore, two lunar tidal-wave crests, one directly under the moon and the other on the side of the earth opposite the moon. This explanation is modified somewhat on account of the attraction of the sun, which at times tends to increase, and again at times to diminish, the lunar tide. We thus get the high tides of new and full moon (spring tides) and the low tides of certain other ages of the moon (neap tides). And the double tidal wave explains why there are two high tides and two low tides every twenty-four hours. This explanation is called the 'equilibrium' theory of the tides. It is very plausible, but unfortunately it fails to agree with observed facts, though it is nevertheless of great use in leading up to a better theory. Under the equilibrium theory we should expect high water at any place about the time when the moon, as astronomers say, passes the meridian. This time might be modified by the solar effects, but only to a rather small amount easily calculated. Unfortunately, this is not in accord with observation. There are places where the high water comes as much as six hours away from the meridian passage of the moon. In other words, the equilibrium theory is at times in error by the maximum possible amount. The trouble is that it tells us what would happen if the forces governing the tides had plenty of time to act. But the turning of the earth on its axis continually presents a new meridian to the moon, so that the tidal-wave crest is always following the moon, ever trying to be highest directly under it. Thus what should occur under the equilibrium theory is greatly modified by the theory of the motion of fluid waves. This leads them to the 'dynamical' theory of the tides.

A consideration of the subject is much simplified by assuming a condition of things that does not really exist in nature. Let us imagine a canal full of water encircling the earth at the equator. Sir Isaac Newton was the first to investigate what would happen to a wave set in motion in such a canal. It can be shown mathematically that the speed at which such a wave would travel depends simply on the depth of the canal. The deeper the canal, the greater the speed of the wave. This is, of course, very important, and shows what a perfectly free wave would do under such simplified conditions. It can even be computed that if the canal were 13¾ miles deep, the wave would travel round the earth in exactly twenty-four hours. Now, it is the tendency of the sun and moon to set such a free wave in motion at each instant of time; and these go on traveling along more or less like the supposed simple wave in the canal. If the ocean were 13¾ miles deep, the waves would have a period of one day; and the new free waves forming all the time would reinforce the old ones, leading to an enormous tidal accumulation. Fortunately, the ocean is much less than 13¾miles deep, and the waves travel much more slowly than once a day. It may happen, therefore, that as the waves travel around the earth, their speed may be such that we shall find a wave hollow instead of a wave crest under the moon. Thus, the modification of the equilibrium theory by the wave motion may at times completely reverse things, giving us low tide when we should expect high tide.

We may carry the canal idea a step further, with a remarkably interesting result. Suppose the whole surface of the earth were covered with a series of canals parallel to the equatorial canal. Then, as we approach the pole, the canals will be shorter, since the equatorial circumference of the earth is longer than it is in any other latitude. Thus the waves in high latitudes would not have so far to go as the waves in low latitudes, and so might tend to reinforce each other as explained above. So we might have 'inverted' tides in the equatorial regions and direct ones in the polar regions; and in some intermediate latitude there would be, as Darwin says, "very great tides, the nature of which cannot be specified exactly." This would occur, as we have seen, where the earth's circumference is short enough to permit a free wave to go all around in about twenty-four hours. These dynamical considerations of wave motion in canals lead to results bearing some sort of resemblance to the actual observed phenomena of nature. It should be noted, of course, that the foregoing considerations refer to theoretical conditions such as would exist if the earth were simply covered with a layer of water. But the actual facts of nature are so different that they modify very greatly the theoretical tidal action of the sun and moon. So large a part of the terrestrial surface is covered by land that the free motion of tidal waves is seriously impeded. It is therefore impossible to predict the times of high water accurately from theoretical considerations alone. Fortunately, the practical prediction of the time of high water for any place can be effected by analyzing a long series of tidal observations made at the place in question. This method of procedure has been in use for many years, and we now possess tidal tables for all principal seaports accurate enough for the purposes of navigation.

An interesting modification of ordinary tides occurs in rivers. Here the tidal rise appears of course as a strong current running up-stream, where the ocean level outside the river-mouth has been raised. At times this tidal current advances with a high and dangerous wave crest (called a *bore*), and it may acquire velocity enough to raise the water-level in the river considerably above that of the ocean outside. Phenomena of this kind, and indeed all tidal phenomena, are partly modified by the configuration of the coast line and the depth of water.

TIDE WATERS. Waters subject to the ebb and flow of the tides. The term is of legal significance because synonymous in the common law with 'navigable waters,' in relation to which were developed the system of rules defining the rights and obligations of transportation and commerce thereon. The open sea is the common property of all nations (see HIGH SEAS) and the rights of a particular nation thereon are restricted to the marginal belt of a marine league. (See TERRITORIAL WATERS.) By the rules of the common law still prevailing in England, both the title and dominion of the sea, and of all rivers and arms of seas where the tide ebbs and flows, and of all lands below high-water mark, including both the shore and the soil under such waters, are vested in the Crown for the public benefit. Tidal waters are public highways, but non-tidal waters, though actually navigable, are subject to private ownership, the riparian owners holding title to the middle of the stream, subject to the paramount right of the public use for navigation. In the United States the physical features of the country and its dual political organization rendered a strict application of the common-law rule inexpedient, and the law in regard to inland streams not subject to tides varies somewhat in this regard in the different State jurisdictions. Prior to the adoption of the Constitution, the colonies existing as separate political entities had exercised full sovereignty. While under the Constitution the Federal Government possesses exclusive jurisdiction over dealings with foreign nations and in the regulation of interstate commerce (Article I. § viii. sub. 3), yet the title and dominion of tidal waters and lands remains prima facie vested in the several States abutting thereon for the public benefit, subject only to the paramount right of navigation, which, whether of foreign or interstate commerce, is under the governance of the general Government. In this respect also the rights of the original thirteen States and of those later admitted are the same, and as to the territory acquired subsequent to the adoption of the Constitution, the title and dominion of such tidal lands and waters passes to the United States for the benefit of the whole people, but impressed with a trust for the several States ultimately created out of said territory, except in cases where grants have been made by the sovereignty exercising jurisdiction prior to its acquisition by the United States, or where said lands are subject to trusts requiring other disposition. Such were the rules laid down in regard to the territory of California acquired from Mexico. Yet it has been sometimes held that Congress has the power, whenever necessary and proper, to grant lands below high-water mark in tidal waters in territories belonging to the United States.

In Canada it has been decided that the Saint Lawrence River and the Great Lakes are public navigable waters and are not subject to the common-law rule applying to non-tidal waters, which vests title to the middle of the stream in the riparian owners, but that title and dominion thereto belong to the Crown for the use and benefit of the public. Further, by the English law the power of legislation over both tidal and non-tidal waters is vested in Parliament. Private rights to shores and to lands beneath tidal waters can be acquired only by express grant, prescription, or usage. In England the recipient of such grant cannot sustain a claim prejudicial to the public user. In the United States the right of State legislatures to alienate this right of public domain has not been accurately defined. The Supreme Court of the United States has recognized this right so far as it does not substantially impair the interests of the public. Instances of such valid grants are those made to a municipality for docks and like commercial facilities, grants to railroads for right of way, and grants to owners of uplands for beneficial enjoyment or commercial purposes. Impediments to navigation in tidal waters unless authorized by a competent power are nuisances and may be abated. When by unavoidable accident a vessel is sunk and the owner abandons control, he is not liable for injuries caused thereby, though navigation is obstructed.

See such articles as RIPARIAN RIGHTS; HIGH SEAS; MARE CLAUSUM, etc., and consult Gould, *The Law of Waters* (3d ed., Albany, 1900); Coulson and Forbes, *The Law Relating to Waters* (2d ed., London, 1902).

TIDORE, tē-dō'rā. A small island of the Molucca Archipelago, situated off the west coast of Gilolo, a few miles south of Ternate (q.v.). It is important as the seat of the Sultan of Tidore, who, under Dutch supervision, exercises authority over parts of Gilolo, New Guinea, and neighboring islands. See MOLUCCAS.

TIE. In music, an arch drawn over two notes on the same degree, uniting them so that they are played or sung as one single note of the same value. See SYNCOPATION.

TIECK, tēk, CHRISTIAN FRIEDRICH (1776-1851). A German sculptor, born in Berlin, pupil of Schadow there, and of David d'Angers in Paris. In 1801-05 he was employed at Weimar, where he associated with Goethe, and designed his bust, which he afterwards also executed in marble for the Walhalla. In 1805 he went to Italy, returning to Germany in 1809, at the invitation of Crown Prince Ludwig of Bavaria. For this patron he executed at Munich and Carrara a large number of busts, including those of the Prince himself, of Schelling, of Humboldt, and of his brother, Ludwig Tieck. In 1819 he began his celebrated series of mythological sculptures for the Royal Theatre at Berlin, and in 1820 he was made professor at the Berlin Academy. This work occupied him until 1829, when he began the series for the Berlin Museum, which include the bronze group of "Horse Tamers" upon the roof, and a statue of Schinkel in the corridor. Tieck was one of the principal representatives of the school founded by Rauch. His technique, however, was less naturalistic than that of Rauch, and smoother and more detailed in execution.

TIECK, LUDWIG (1773-1853). A German romantic novelist, translator, and critic, brother of the preceding, born in Berlin. After studies at Halle, Göttingen, and Erlangen and four years of literary work in Berlin, Tieck went to Jena in 1799 and joined the Schlegels and Novalis in their romantic agitation. Leaving Jena, he went to Dresden, moved to Frankfort on the Oder, visited Italy (1805), England and France (1817), and in 1825 became director of the Dresden Court Theatre after having since 1819 been the centre of a literary circle there. Royal favor brought him in 1841 back to Berlin, where his dramatic talents were used in the production of several Greek plays. Tieck's significant literary career opens with *Abdallah* (1795), *Sternbalds Wanderungen* (1798), and *William Lovell* (1795-96), all novels of 'storm and stress.' His youthful imagination ran riot also in mediæval legends and fairy tales, e.g. the three volumes of *Volksmärchen* (1797), among which were versions of *Puss in Boots, Bluebeard,* and *Red Riding Hood.* A comedy, *The World Topsy-Turvy* (1799), *Die verkehrte Welt,* proclaimed even more emphatically his period of romantic revolt. To this year belong also the ultra-romantic *Phantasien über die Kunst,* full of enthusiasm and of a mystic religiosity. His *Romantische Dichtungen* (2 vols., 1799 and 1800) were the first work to show the direct influence of association with the Schlegels. They were followed by an admirable translation of *Don Quixote* (1799-1801) and by *Kaiser Octavianus* (1804), his longest novel. This period of rapid production was succeeded by a nervous breakdown. After his recovery his work is less mystic, less erratic, more artistic, e.g. *Phantasus* (1812-17), and an edition of Ulrich von Lichtenstein's *Frauendienst* (1812), but Tieck did not reach the complete maturity of his genius till his visit to England, the direct results of which are *Shakespeares Vorschule* (1823-29), *Dramaturgische Blätter* (1826), and his noble continuation of Schlegel's translation of Shakespeare. Indirectly the same influence is seen in the *Novellenkranz* (1831-35; 12 vols., 1853). Tieck's *Works* are in 28 volumes (1828-54). Some tales and novels are translated by Carlyle and by Thirlwall. Consult the German studies by Köpke (Leipzig, 1855), Friesen (Vienna, 1871), and Steiner (Berlin, 1893). Carlyle's *Essay on Tieck* was published in 1823 and introduced him to English readers.

TIEDGE, tēd'ge, CHRISTOPH AUGUST (1752-1841). A German poet, born at Gardelegen, Prussian Saxony. After studying jurisprudence at Halle, he occupied positions as secretary and tutor at Magdeburg, Ellrich, and Halberstadt, and in 1799 settled in Berlin. There he met Elisa von der Recke, whom he accompanied on a journey to Italy in 1804-06, remaining afterward her faithful companion, first in Berlin and from 1819 on at Dresden, where, placed beyond material care by his friend's last will, he continued to live until death. Some singable lyrics, of which "Schöne Minka, ich muss scheiden" is still unforgotten, first established his reputation, and *Urania über Gott, Unsterblichkeit und Freiheit* (1800; 18th ed., 1862), a lyric-didactic poem, inspired by the ethics of Kant, enjoyed wide popularity in the beginning of the nineteenth century. A kind of sequel to it were the *Wanderungen durch den Markt des Lebens* (1833). Among his other poetical efforts, the *Elegien und vermischte Gedichte* (1803) met with the greatest success.

After his death the Tiedge Foundation was established in Dresden for the purpose of caring for the poet's grave and of granting subventions to poets and artists or their widows and children. Administered by the Saxon Ministry of Public Instruction, its funds amounted to more than 662,000 marks, in 1901. Consult: Falkenstein, *Tiedges Leben und poetischer Nachlass* (Leipzig, 1841); Eberhard, *Blicke in Tiedges und Elisas Leben* (Berlin, 1844); and Kern, *Beiträge zu einer Charakteristik des Dichters Tiedge* (ib., 1896).

TIEFFENBRUCKER, tē′fen-brụk′ẽr. A well-known violin-maker of the sixteenth century. See Duiffopruggar, Caspar.

TIEL, tēl. A town in the Netherlands, Province of Gelderland, situated on the right bank of the Waal, and on the Elst-Dordrecht Railway, 19 miles west of Nimeguen (Map: Netherlands, D 3). The town possesses the beautiful Church of Saint Mary, partly finished, the Church of Saint Martin, dating probably from the twelfth century, and a communal college. Tiel was an important commercial centre as early as 972, when it received municipal privileges from the Emperor Otho I. It is the principal trading place of the Neuse-Waal district. It manufactures mustard and madder. Population, in 1890, 9896; in 1900, 10,788.

TIELE, tē′le, Cornelis Petrus (1830-1902). A Dutch theologian. He was born near Leyden, and studied at Leyden and Amsterdam. He then entered the ministry, being connected with the Remonstrant or Radical sect of the Evangelical Church, and served churches at Moordrecht and Rotterdam (1853-1872). Meanwhile he continued his theological studies and published a valuable work on Zoroastrianism, *De Godsdienst van Zarathustra* (1864). In 1866 he began with Kuenen the editing of the *Theologisch Tijdschrift*, which at once became one of the leading Continental reviews. In 1872 he published a *Comparative History of Egyptian and Semitic Religions*. In 1873 he became professor of theology at the Remonstrant Seminary at Leyden, and while there published a *Manual of the History of Religions* (1876), which at once took a leading place in the literature of the subject. It has been translated into English (*History of Religion*, London, 1877). In 1877 Tiele became professor of the history and philosophy of religion. In 1893 he began the publication of a monumental work on *The History of Religions Down to the Days of Alexander the Great*, three volumes of which have appeared, and a fourth posthumous volume is expected (translated into German, *Geschichte der Religion im Alterthum*, Gotha, 1895). In 1896-97 he gave two courses of lectures at Edinburgh on the Gifford Foundation, published as *The Elements of the Science of Religion* (1897-99), and also in Holland and Germany. He also wrote the article "Religion" in the *Encyclopædia Britannica*, 9th ed. His *Babylonisch-assyrische Geschichte* (Gotha, 1886-88) has but one rival in its extensive scope. Consult notices by Jastrow in *The Open Court*, vol. xiv.; *The Independent*, vol. liv.; and *The Study of Religion* (New York, 1902).

TIENEN, tē′nen. A town of Belgium. See Tirlemont.

TIEN-TSIN, tyĕn′tsin′; properly **T'IEN-TSIN** (Heaven's Ford). A city and treaty port of the Province of Chih-li, China, situated on the eastern edge of the Great Plain, in latitude 39° 10′ N., longitude 117° 48′ E., on the right bank of the Pei-ho (Map: China, E 4). It is at the junction of the Pei-ho with the Grand Canal, which, prior to the silting of the canal, afforded easy inland communication with many of the great cities of the country and bore to Tien-tsin the great fleets of junks engaged in the transportation from the south of the 'tribute-rice' for the provisioning of Peking. It is 70 miles by water from the sea, and about 70 southeast of Peking. It is in rail communication with Peking, the Kai-ping coal mines, Shan-hai-kwan, and Manchuria, and with Pao-ting-fu, and thence southward through Ching-ting with Hankow. The city, which was only a wei or military station until 1782, is comparatively small. Its walls of brick and stone are 30 feet high, nearly four miles in circuit, and pierced with four gates surmounted with towers. The houses are generally of brick or pressed mud, and only one story high. Like those of most Chinese cities, the streets are filthy and ill-kept. The suburbs are very large, and in them is carried on most of the trade. The population is 1,000,000. In 1860 Tien-tsin was opened by treaty to foreign residence and trade. The Foreign Settlement—known as Tsu-chu-lin, or 'Red-Bamboo Grove'—is also situated on the right bank of the river and about 1½ miles below the city, but within the line of circumvallation known as 'San-ko-lin-sin's Folly.' It is laid out in foreign style, has a jetty or pier and a fine bund or esplanade along the river bank, good, well-kept streets, fine dwellings and warehouses, gas, electric lights, and many good public buildings, such as the custom house and the town hall, known as Gordon Hall. There are schools, hospitals, club houses, and the naval school established by Li Hung Chang, and within a short distance are two well-equipped arsenals. The government of the settlement is vested in a municipal council elected by and composed of the land-renters.

Tien-tsin has no factories. Its principal manufactures are straw braid and sam-shu, and cured skins and tobacco. There is an immense trade in salt.

In 1901 the total value of the trade of the port, as shown by the Imperial Maritime Customs Reports, was $38,370,000, of which $20,450,000 represented direct foreign imports. The principal imports are woolens, drills, sheetings, shirtings, jeans, twills, seaweed, sugar, rice, grain, kerosene oil, tea, opium, steel, and salt (the last is a Government monopoly). The articles of export are sam-shu, straw braid, furs, goatskins, camels' wool, coal, wood, tobacco, fruit, and rhubarb. Nearly all the tea consumed in Asiatic Russia is shipped from the south to Tien-tsin, from which point it goes overland by caravans to Kalgan, and thence to Siberian ports.

In 1853 Tien-tsin was besieged by a strong force of Taiping rebels on their way to Peking, but they were defeated by the Mongol general San-ko-lin-sin and driven off. In 1860 it was taken by the Anglo-French punitive expedition on its way to Peking. While Li Hung Chang was Viceroy of Chih-li, from 1870 to 1895, he made his headquarters at Tien-tsin, and in consequence the city was the centre of much political interest. Its importance in this respect greatly declined when Li was removed from office after the disastrous war with Japan in 1894-95. During the Boxer uprising in 1900 the foreign settlement suffered from the besieging Boxers, and the city from the relieving forces of the Allies. The city held out until the severe fighting of July 13th-14th, during which the Allies lost in killed and wounded between 800 and 900, the United States contingent, in proportion to its number, suffering most. The city is connected with the rest of the world by cable, and with the British Legation in Peking by the Marconi wireless system. Owing to the importance of the foreign business interests centred here, and the proximity of the town to Peking, the Viceroy of the province, whose seat is at Pao-ting-fu, spends a large portion of the year here. As the river freezes over in winter, Tien-tsin is cut off from the outer world from about November to April, but the foreign admirals always agree to have at least one gunboat stationed off the bund during that period.

TIEPOLO, tê-ä'pô-lô, Giovanni Battista (1696-1770). The last great master of the Venetian school of painting. Of his life hardly anything is known. He was not a member of the celebrated family of Tiepolo, as has been supposed. He was born April 5, 1696, and at an early age was placed with the painter Lazzarini, a mannerist, whom he soon left for Piazzetta. He was, however, more influenced by the great masters of the past, especially by Veronese. It is impossible to fix the dates for his pictures before 1737. We know that he was famous long before that, and was patronized by the Doge Cornaro and noble Venetian families, and by many cities and churches in Northern Italy. The first of his principal works that can with certainty be dated are the beautiful decorations of the Villa Valmerana at Vicenza, executed in 1737. The subjects are taken from Homer, Vergil, Ariosto, and Tasso. In freshness and charm, in conception and technique, they bear favorable comparison with Veronese's masterpieces in the Villa Maser. In 1739 followed the three ceiling decorations in Santa Maria del Rosario (Venice), including the "Institution of the Rosary," and in 1743-44 those of the church of the Scalzi, the chief of which represents "Angels Bearing the Casa Santa from Nazareth to Loreto." To the same period belong the ceiling paintings of the Palazzo Rezzonico, and about 1745 he decorated the grand hall of the Palazzo Labia. The ceiling is highly fantastic, and the illusive architectural decorations of the walls form an admirable framing for two of his best frescoes, "Cleopatra's Banquet" and the "Embarkment of Cleopatra and Anthony." The date of his decorations in the archiepiscopal palace at Udine, one of his best works, is not known.

Under the patronage of Karl Philipp of Greifenklau, Bishop of Würzburg, Tiepolo passed the years 1750-53 in that city, engaged in decorating the episcopal (now the royal) palace. On the lofty ceiling over the grand staircase he painted frescoes of "Olympus" and of the "Four Quarters of the Earth;" in the Kaisersaal, three scenes from the life of Frederick Barbarossa; in the chapel, two large altar-pieces, the "Ascension of the Virgin" and the "Fall of the Angels." Returning to Venice in 1754, he became director of the Venetian Academy. Between this time and his departure for Spain he painted another grand ceiling decoration, the "Triumph of Faith," in the Chiesa della Pietà, and perhaps most of his easel pictures. About March, 1762, he was summoned by King Charles III. to Spain to decorate the royal palace. In the guard room he painted the "Smithy of Vulcan," in the ante-room an "Apotheosis of Spain," and in the throne-room, magnificent ceiling frescoes of "Spain and Her Provinces." At Madrid he executed most of his etchings, and it was there that he died, March 22, 1770.

In the classical reaction immediately following Tiepolo's death, scant justice was done him, and not until comparatively recent times has he been accorded his place. His art is essentially decorative, and harmonizes perfectly with the Rococo architecture of the day. The color is light and flaky, and exquisitely delicate, and the treatment of light is above reproach. To a wonderfully rich fantasy and invention he joined an equal facility of execution. Sometimes he degenerates into extravagances, and what prevents him from ranking with the greatest artists of all time is the frivolity of his conceptions and the artificiality consequent upon the lack of a more direct contact with nature.

Tiepolo's easel pictures show the same grace of form and charm of color as his frescoes, and are more carefully executed. Among the best known are "Christ in the Garden of Olives" and "Calchas and Iphigenia," in the Liechtenstein Gallery at Vienna; "Saint Catherine of Siena" and an "Adoration of the Kings," in the Imperial Gallery (ib.); "Martyrdom of Saint Agatha" and "After the Bath," in the Berlin Museum; the "Immaculate Conception" at Vicenza and Madrid; and a "Holy Family with Saint Gaetano," in the Venetian Academy. In the Venetian churches are several altar-pieces, like "Madonna in Glory" in the Church of the Jesuits, and "Christ Bearing the Cross" in Sant' Aluise. His etchings show much taste and neatness of execution, and in their weird humor and naturalism they resemble those of Goya, whose *Caprichos* probably inspired Tiepolo's principal series, *Scherzi di Fantasia*. Of his two sons, who assisted in most of his works, Domenico (1727-1804) etched several of his father's paintings and painted inferior frescoes in his style, while of Lorenzo, the younger son, almost nothing is known.

Consult: Zanetti, *Della pittura veneziana* (Venice, 1771); Urbani de Gheltof, *Tiepolo e la sua famiglia* (Venice, 1879), and *Tiepolo in Ispagna* (Venice, 1881); Molmenti, *La villa Valmarana* (Venice, 1880), and *Carpaccio e Tiepolo* (Turin, 1885); and the biographies of Wessely, in Dohme's ***Kunst und Künstler Italiens*** (Leipzig, 1877); Leitschuh (Würzburg, 1896); and Chennerières (Paris, 1898).

TIERCE (OF., Fr. *tiers*, third part, from Lat. *tertius*, third, from *tres*, three). In music, an interval (q.v.) synonymous with a third. In the organ, a mutation stop pitched 2⅓ octaves above the diapason.

TIERCE. In heraldry (q.v.), a term of blazon used to indicate that the field is divided by lines into three equal parts.

TIERGARTEN, tēr′gär-ten (Ger., Zoölogical Garden). The largest park of Berlin, on the south side of the Spree and west of the Brandenburg Gate. It contains 600 acres and is about 2 miles long. Portions of the park retain the natural features of forest and lake. It contains a number of fine statues and the column of victory from which the Siegesallee, the most fashionable drive of the city, leads south.

TIER′NEY, George (1761-1830). An English politician. He was born at Gibraltar, Spain, was educated at Eton and Cambridge, and in 1778 entered Parliament as a Whig. There he soon acquired a high reputation as a debater, and, after Fox's withdrawal, became a prominent if not the leading opponent of Pitt's policy. For several years it was his custom to bring forward a series of resolutions opposed to those of the Chancellor of the Exchequer. He was finally accused by the latter of deliberately impeding public business, and as a consequence fought a bloodless duel with him. In 1803 he became treasurer of the navy and a Privy Councilor, and after acting as Secretary of State for Ireland (1806), was president of the Board of Control (1806-07) and master of the mint in Canning's Ministry (1827-28). After 1817 he was the recognized leader of the Opposition.

TIERRA DEL FUEGO, tē-ĕr′rȧ dĕl fwā′gō (Sp. Land of Fire; formerly often written in the corrupted form Terra del Fuego). An archipelago situated between latitude 52° and 56° south, off the extreme southern end of South America, from which it is separated by the Strait of Magellan (Map: America, South, C 8). It consists of a large main island sometimes called King Charles South Land, and a number of smaller islands lying to the west and south of it, the southern group being separated from the main island by Beagle Channel. The total area of the archipelago is estimated at over 27,000 square miles, of which the main island occupies more than four-fifths. The principal of the smaller islands are, beginning at the northwest, Desolación, Santa Inez, Clarence, Hoste, Navarin, Wollaston, and at the extreme south, Horn Island, ending in Cape Horn. At the extreme east lies the isolated Staten Island or Isla de los Estados. All these islands are separated from each other and from the mainland by narrow, deep, and tortuous channels, and are, together with the west coast of the main island, deeply indented by narrow fiords. The east coast is more regular. The Andean mountain system is continued in several ranges through the western part of the archipelago, covering all the smaller islands and the western half of the main island. They are mostly of Mesozoic formation with considerable granitic and volcanic intrusions, though there are no volcanoes. Their height averages 3500 feet, and Mount Sarmiento, an imposing snow-clad peak on the southwestern peninsula of the main island, has an altitude of 7200 feet. The eastern half of the main island is a continuation of the Patagonian plateau.

The climate of Tierra del Fuego is not so rigorous as it was formerly supposed to be. It is an equable oceanic climate with no extreme heat or cold. A meteorological station established since 1896 at Ushuaia on Beagle Channel shows a mean temperature for January to be 52.7°, and for July 31°. The rainfall is greater than on the Patagonian plateau, and the country is more favorable for settlement than the more northern regions. The eastern region has good soil and pasture land, and along the base of the mountains there are extensive forests of beech (*Fagus antarctica*) and pine. The western islands, which have not been thoroughly explored, are less favorable as regards climate and soil, but in the east and along Beagle Channel hardy cereals will ripen, and considerable areas of land have already been brought under cultivation by white settlers. Agriculture and cattle-raising are the main occupations, though gold has been found in paying quantities, and seams of lignite have also been discovered. The native Fuegians are rapidly disappearing, and now number probably less than 1000. They belong to three distinct tribes, the Aliculufs in the central regions, the Onas in the west, and the Yaghans in the south. Politically the portion of the main island lying east of a line running from the eastern entrance of the Strait of Magellan to the middle of Beagle Channel, together with the Isla de los Estados, constitutes the Argentine Territory of Tierra del Fuego (q.v.). The remaining portions belong to the Chilean Territory of Magallanes. The civilized population of the Argentine Territory, which contains practically all the inhabitants, was 477 in 1895, and 2159 in 1900. The archipelago was discovered by Magellan in 1520, but was never systematically explored until the last two decades of the nineteenth century.

Consult: Bove, *Patagonia, Terra del Fuoco* (Genoa, 1883); Hyades and Deniker, *Anthropologie et ethnographie* (Paris, 1891); Conway, *Aconcagua and Tierra del Fuego* (London, 1902).

TIERRA DEL FUEGO. A territory of Argentina, formed of a portion of the main island of the Archipelago of Tierra del Fuego (q.v.) and of the Isla de los Estados. It is bounded on the west by the meridian of 68° 34′ W., which separates it from the Chilean territories; on the north and east by the Atlantic Ocean; and on the south by the Atlantic Ocean and the Beagle Channel (Map: Argentina, D 14). Its area is about 8000 square miles. The territory of the island was in dispute until 1881, when by arbitration of the United States it was divided between Chile and Argentina. The territorial Government of the Argentine portion was organized in 1884. The main river, Pellegrini, is of little importance. The capital is Ushuaia (q.v.).

TIERS ÉTAT, tē-âr′ zȧ′tȧ′. See States-General.

TIES, Railway. See Railways.

TIETJENS, tē′tyĕns, or **TITIENS,** Teresa (1837-77). An operatic singer, born at Hamburg, of Hungarian parents. She made her début in that city in the character of Lucrezia Borgia in 1849, taking at once a very high position on the lyric stage; at Frankfort and Vienna she was even more warmly received; and her first appearance in London in 1858 was a complete triumph. She visited the United States in 1875. The great volume and purity of her voice and her sympathetic and dignified acting combined to make her famous in strong dramatic parts.

TIF′FANY, Charles Comfort (1829—). A Protestant Episcopal clergyman. He was born in Baltimore; studied at Dickinson College, Andover Theological Seminary, and the universities of Halle and Heidelberg; and was ordained priest in 1866. He was rector at Fordham, N. Y. (1867-71), assistant rector at Trinity Church, Boston (1871-74), rector in New York (1874-90), and Archdeacon of New York (1893-1902). His publications include *History of the Protestant Episcopal Church* (1893) and *The Prayer Book and Christian Life* (1897).

TIFFANY, Charles Louis (1812-1902). An American merchant. He was born at Killingly, Conn., and after receiving an academic education at Plainfield Academy, and serving an apprenticeship in a cotton manufactory, he removed to New York City in 1837. There in partnership with a fellow townsman, John B. Young, on a borrowed capital of $1000 he established at 259 Broadway, next door to A. T. Stewart's, a stationery and fancy goods store. The venture prospered from the start, and gradually the jewelry part of the business became the most important. In 1847 the firm began the manufacture of gold jewelry. In the following year, when as a result of the widespread revolutionary movements in Europe the price of diamonds fell 50 per cent., Mr. Tiffany sent word to his partner, Mr. Young, who was then in Paris to buy all the diamonds he could. This was done with the result that the house thereby reaped a large fortune and became from that time on one of the principal firms of diamond merchants in the world. Several times the rapidly increasing business necessitated moving into larger quarters farther up town and several times the firm name was changed, finally becoming Tiffany & Co. in 1851. At that time a branch house was established in Paris. During the Civil War Mr. Tiffany placed his store and resources at the disposal of the Government, and it became for a time one of the principal depots of military supplies. During the draft riots (q.v.) in 1863 the store was barricaded and the clerks were armed in preparation for a threatened attack of the mob. In 1868 the firm was incorporated and in 1870 removed to a specially constructed building on Union Square. At that time, in addition to the Paris branch, a branch house was maintained in London, and an office and watch factory in Geneva, Switzerland, and the house took rank as the leading importers of gems and works of art as well as the chief manufacturing jewelers in America. Mr. Tiffany was the first to adopt the department store plan for the jewelry business and was the originator of many ideas and methods in the jewelry trade since generally adopted. The sterling silver standard .925 fine, adopted by him in 1851, became the recognized standard throughout the country. Mr. Tiffany was made a member of the French Legion of Honor in 1878 and received at various times decorations from other foreign rulers. He was a liberal patron of the fine arts, and did much to encourage and promote the study and knowledge of art in America.

TIFFANY, Louis Comfort (1848—). An American painter and decorative designer, born in New York City. He was a pupil of George Innes and Samuel Coleman, and in Paris of Léon Bailly, making a special study of the decorative arts in their relation to architecture. After his return to the United States he resided in New York City and devoted his attention to the direction of the Allied Arts Company and the Tiffany Glass and Decorative Company. He introduced the art of mosaic in this country, and produced designs of high power and good decorative quality. His best known invention, however, is favrile glass, in which by chemical means he produced delicate refracting powers somewhat like those in ancient glassware affected by decomposition. His works include windows for Columbia University Library, Memorial Hall, Harvard College, and Yale College, and for many churches. His principal mosaics are in the crypt of Saint John's Cathedral, in New York City. His easel paintings are principally Oriental scenes.

TIF′FIN. The county-seat of Seneca County, Ohio, 40 miles southeast of Toledo; on the Sandusky River, here spanned by several bridges, and on the Baltimore and Ohio, the Pennsylvania, and the Cleveland, Cincinnati, Chicago and Saint Louis railroads (Map: Ohio, D 3). It is the seat of Heidelberg University (Reformed), opened in 1850, and of the College of the Ursuline Sisters, and has a public library. Other prominent features are the court-house, the Soldiers' Monument, and Riverview Park. Tiffin is favorably situated for commerce and also has large industrial interests. Among its manufactures are tools, pottery, glass, emery wheels, church furniture, agricultural implements, wagons, well-drilling machines, nail, bolt, and nut machines, underwear and woolen goods. The government is vested in a mayor, elected every two years, and a unicameral council. Tiffin was settled in 1819-21 and was incorporated in 1850. Population, in 1890, 10,801; in 1900, in 10,989.

TIFFIN, Edward (1766-1829). An American physician, preacher, and political leader. He was born at Carlisle, England, removed to Charlestown, Va., about 1786, and graduated in medicine at the University of Pennsylvania in 1789. In 1792 he became a local preacher in the Methodist Church, and also studied law. About 1798 he removed to Chillicothe, in the Northwest Territory, and in 1799 was Speaker of the Territorial Legislature. In 1802 he presided over the convention to frame a State Constitution of Ohio, and was the first Governor of the State (1803-07). During his second term he arrested the Burr-Blennerhasset expedition. In 1807-09 he was a member of the United States Senate, but resigned, and in 1809 was Speaker of the Ohio Legislature. When the General Land Office was established in 1812, President Madison appointed Tiffin the first Commissioner, and by his foresight the latter saved all the papers when the Capitol was burned by the British troops in 1814. From 1815 until just before his death he was Surveyor-General of the Northwest Territory. The town of Tiffin, Ohio, was named in his honor.

TIFLIS′, *Russ. pron.* tyêf-lyēs′. A government in the centre of Transcaucasia, Russia. Area, about 17,200 square miles (Map: Russia, F 6). It belongs to the region of the Caucasus (q.v.) and contains numerous snow-clad peaks, including Kazbek, over 16,000 feet in height. Between the mountain chains are deep and narrow valleys which make Tiflis one of the most picturesque and striking parts of the Caucasus. The principal river is the Kur. The climate is very severe in the mountainous part. About one-third of the total area is covered with forests. Agriculture is the principal occupation in the valleys and stock-raising in the mountain regions. Besides cereals, of which wheat is the most important, fruits, especially grapes, are extensively raised. Various metals occur and copper is mined to some extent. The chief manufactures are flour, cotton goods, tobacco, spirits, etc. The natives produce various woolen articles, such as felt, rough cloth, etc., copper and silver articles, silver thread, filigree work, etc. Population, in 1897, 1,040,943, of whom the Georgians and the Armenians constituted 45 and 24 per cent., respectively, and the Russians less than 5 per cent.

TIFLIS. The former capital of Georgia, the administrative centre of the Caucasus, and the capital of the Government of Tiflis, situated on both banks of the Kur, about 340 miles by rail northwest of the seaport of Baku (Map: Russia, F 6). The town presents a very mixed appearance. The Russian quarter is well built, with handsome churches and public buildings and European shops, while the native quarter is built in Oriental fashion. The most noteworthy ecclesiastical structures are the ancient Cathedral of Zion, containing interesting icons and manuscripts; the Monastery of Saint David; and the old church in the fortress, supposed to date from the fifth century. There are a natural history museum with a library, a sericultural station with a museum, and extensive botanical gardens. The principal manufactures are felt, cotton goods, leather products, oil, etc. The trade, mostly in Armenian hands, is very extensive, Tiflis, in virtue of its railway connection with the two main seaports of the Caucasus, as well as with European Russia, being the distributing centre for Transcaucasia. Population, in 1897, 160,645, principally Armenians, Georgians, and Russians. The environs abound in sulphurous springs.

TIGER (Lat. *tigris*, from Gk. τίγρις, tiger; probably connected with Av. *tiyra*, arrow, *tiyra*, sharp, Skt. *tij*, to be sharp, Gk. στίζειν, *stizein*, to mark, puncture, and ultimately with Eng. *stick*). The largest and most powerful of cats, *Felis tigris*, and the most specialized and efficient of the Carnivora, comparable only with the lion, and very similar in size and structure, but very different in appearance and habits. It is more slender and cat-like than the lion, and has a rounder head and no trace of a mane, but the hair of the cheeks is rather long and spreading. Its skull may be distinguished from that of the lion by the fact that the nasal bones reach backward beyond the frontal processes of the maxillæ. The males are rather larger than the females, and make a more square, less oval footprint or 'pug.' The pupil of the eye is round, however much contracted. The average size of an adult male is 9½ feet from nose to tip of tail. Authentic measurements exceeding 11 feet are very rare, and stories of 15 to 18 feet entirely erroneous. Its height at the shoulder is proportionately less than that of the lion, a large male measuring from 3⅓ to 3½ feet. A ten-foot tiger will weigh about 500 pounds. The hair is thick, fine, and shining; in the colder countries thicker and longer than in tropical regions. The color is a bright tawny yellow, beautifully marked with dark transverse bands, passing into pure white on the under parts; the dark bands are continued as rings on the tail, which is long and tapering and has no terminal tuft. These colors and stripes, sometimes broken, although so conspicuous in a caged tiger, or one standing in the open, in daylight, so blend with the dusky gloom and slender shadows of the bamboo jungle or long grass in which the animal lurks as to make it practically invisible.

The tiger inhabits Asia, where it has an extensive but rather localized distribution. Westwardly its range extends to the Lower Euphrates and the southern shores of the Caspian; but it does not occur in Persia south of the Elburz Mountains, nor in Beluchistan or Afghanistan. Northward, it is to be found throughout Southern Siberia and Mongolia, eastward in the Amur Valley to the Sea of Okhotsk, in Saghalien and Japan. The elevated Tibetan plateau has no tigers. Southward the species ranges throughout China, Siam, Burma, the Malay Peninsula, Sumatra, Java, and Bali, and all of India, but is unknown in Ceylon. The last-mentioned circumstance is a strong part of the evidence which has led naturalists to conclude that the tiger is a comparatively recent immigrant into the south, and that it is not naturally a tropical species.

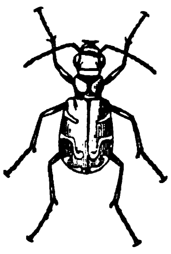
In general the tiger is an inhabitant of the woods and thickets rather than of open lands, and although able to leap into or climb trees (except smooth, perfectly upright ones), it does so only for some special purpose. Usually it hides in some dense cover by day, and goes abroad at night in search of prey. It is most numerous in the swampy shore jungles around the Bay of Bengal and on the Malayan coasts and marshy estuaries, where it swims miles from island to island, or across rivers and inlets.

Its prey consists of almost anything in the way of flesh, from a bison or crocodile to any small creature which it may think it worth its while to strike down. Carrion may be eaten under stress of famine, but as a rule the animal devours only what it has itself killed, and ordinarily does not even return a second time to a carcass from which it has taken one full meal. It searches for and stalks its prey, or lies in ambush and leaps upon it like other cats; and its method of killing large animals, so far as it may be said to practice one, is to seize the shoulders with one paw, grasp the forehead with the other, and break the neck by a twisting pull. A band of bison or wild oxen, guarded by bulls (see BISON), will beat it off, and often kill it; even a single bull in favorable circumstances is a match for it. The elephant and rhinoceros have little to fear, and a bear will make a stout resistance, but such encounters rarely occur; nor do fights between male tigers seem to be common, as this cat is not, like the lion, polygamous. In India and eastward the tiger subsists largely upon domestic cattle and hogs, and upon human beings. 'Man-eaters,' when they do not wholly depend upon human victims, apparently prefer them; many, but not all, of these victims are old and comparatively feeble. The destruction of human life in India and eastward is very great, and there seems little diminution in spite of improved arms, an increasing number of sportsmen, and Government rewards. In 1902 about 1300 lives were so lost in British India alone. The prey when struck down is usually carried away by the tiger to be eaten elsewhere, and extravagant stories of the tiger's strength have been related in connection with this habit. It is absurd to speak of its leaping a palisade with a buffalo or even a man in its mouth. A tiger will lift from the ground and partly carry, partly drag, an animal of 200 or 300 pounds weight, with considerable ease; but heavier ones must be laboriously dragged.

Tigers are solitary beasts, rarely hunting even in pairs, and much less noisy than the lion. Their usual call is a prolonged, moaning, thrilling sound, repeated twice or thrice and becoming louder or quicker. In the cooler season they wander widely, but in the hot weather remain in some narrow district near water—a single one in each 'beat.' Tigresses breed irregularly, once in two or three years only, regardless of season, and produce usually two cubs, almost invariably one male and the other female. The cubs require three years to reach maturity and stay with their mother most of this time. When caught young tigers may easily be tamed, but are more difficult to rear and less tractable than lions. Captive and tamed tigers have been kept by the East Indian rulers from the days of antiquity, and a favorite amusement was to pit them in the arena against lions, in which combats they were usually victorious. The 'royal Bengal tiger' has been a part of the showman's stock in trade ever since, and is to be seen in every menagerie, where these animals breed, but less readily than do the lions. Some have been trained to go through certain performances.

BIBLIOGRAPHY. Recent general works, especially Brehm's, the *Royal*, the *Standard*, and the *Cambridge* "Natural Histories;" Mivart, *The Cat* (New York, 1892); Elliot, *Monograph of the Felidæ* (1878-83); Fayrer, *Royal Tiger of Bengal* (London, 1875); Blanford, *Fauna of British India* (London, 1888); Sanderson, *Wild Beasts of India* (London, 1893); Baker, *Wild Beasts and Their Ways* (London, 1890); Pollok, *Sport in British Burma* (London, 1879); and the writings of Kinloch, Forsyth, Shakespeare, Wallace, Rice, Baldwin, Dawson, and other sportsmen-travelers in Eastern Asia, a capital summary of whose observations will be found in Porter's *Wild Beasts* (New York, 1894). See Colored Plate of FELIDÆ accompanying article LION.

TIGER BEETLE. One of the active, predatory beetles of the family Cicindelidæ. Of the carnivorous beetles they are among the most active, voracious, and fierce, whence they receive their name. They frequent sandy places and earthen paths, and have the habit when approached of running rapidly for some distance, occasionally turning suddenly back, and often taking to flight. While variously colored, and sometimes even bright green spotted with yellowish, they harmonize as a rule with the general color of their environment. Their larvæ live in deep, straight vertical burrows in the ground, and station themselves near the burrow's mouth, holding themselves in position by means of a pair of strong hooks on the fifth segment of the abdomen. The head and thorax are broad, and are used to block the mouth of the burrow while waiting for prey. The food consists of insects which alight on the spot or run over it. Some 1400 species are known, the majority of them inhabiting the tropics. Some species are wingless, while others are very active; some are found only on the mounds of termites; some species frequent the trunks of trees, which they ascend in a spiral manner. Less than a hundred species are known in the United States, but tiger beetles are abundant and are seen everywhere. The largest American form is *Amblychila cylindriformis*, which is found in sandy regions in the mid-Western States. *Tetracha Carolina* and *Tetracha Virginica* are large greenish species found in the Atlantic and Southern States. The genus Cicindela contains more than half the species in the entire family, and a very great majority of the forms which are found in North America. A typical American species, the spotted tiger beetle (*Cicindela sex-guttata*), is depicted upon the Colored Plate of INSECTS.


A TIGER BEETLE.

TIGER-CAT. Any wild cat of medium size which resembles the tiger in form or markings. The ocelot, serval (qq.v.), and especially the chati (*Felis mitis*) of South America, and clouded tiger of India, are frequently so called. See WILDCAT.

TIGER-FLOWER (so called from the coloring), *Tigridia Pavonia.* A plant of the natural order Iridaceæ, distinguished by the three large outer segments of the perianth and by the filaments being united into a long cylinder. It is a native of Mexico, but hardy enough to endure the climate of the United States, and much cultivated in flower-gardens for the singularity and great beauty of its ephemeral flowers. The root is a scaly bulb.

TIGER-HUNTING. Tiger-hunting probably taxes man's skill and courage in a higher degree than the pursuit of any other sort of game, and may justly be placed at the head of the list of sports of the chase. The enormous strength of the beast, coupled with savage cunning, renders it the most formidable of brute foes. Nothing is more patent in the voluminous history of the sport (see TIGER for outline of pertinent literature) than that no two tigers behave in the same way when encountered; and the same animal may act differently at different times. Tigers learn by experience, have no fear whatever of man *as man*, and rarely make tactical mistakes. In some parts of India hunters in parties go after them on foot, but this is justly regarded as an extreme of foolhardiness; the hunter's handicap is far too great, and few men dare the risks of this kind of sport. One of two methods usually is chosen by the tiger-hunter according to circumstances: (1) lying in wait for the animal at night (when there is moonlight) on an elevated platform, or (2) seeking him upon the back of a trained elephant. The former is the choice in cases where a tiger is known to haunt a particular locality. The hunter then chooses a likely spot and builds a platform or 'machan' (usually in a small tree), which must be raised not less than 12 feet above the ground, and be large enough to hold two persons. On the ground near by is placed the carcass of a deer or cow; an even better bait is a tethered live goat. An hour before sunset the hunter, with a native assistant, climbs upon the platform and awaits the coming of the tiger. Sometimes the animal steals out of the shadows and seizes and carries off the prey so quickly that no good chance for a shot is offered. Again it will stalk boldly out and stand in full view. Sometimes when fired at, but not killed, it darts back into the jungle and disappears, but it may also attack and tear down the machan, or lurk near by to seize the men when they descend.

The most effective method of hunting the tiger is by means of elephants, and with the aid of native shikaries and beaters. Frequently the preparations are upon a scale of royal magnificence, for so kings and princes are accustomed to entertain one another in the East, especially when a native ruler desires to honor or gratify some European guest or ally. On such occasions the game has been surrounded and watched for days previously by an army of natives. The costly and splendid tiger-hunting with which King Edward VII. was entertained when visiting India as the Prince of Wales will long remain memorable even in that country of royal pageantry. The method in this master-sport is to surround the tiger by a sufficient number of 'beaters,' who, by beating drums and making a great noise, drive it toward the favorable spot where the sportsmen are awaiting it upon the backs of elephants, which are furnished with open, box-like howdahs. As the circle narrows the drivers become more cautious, for the animal may be depended upon to know the country perfectly, and to make use of every means of concealment and escape, or of attack. Then men are stationed in trees to try to trace his movements and warn others by cries and signs. Meanwhile the sportsmen press forward on their elephants, depending largely upon the senses and sagacity of these animals for a warning of the terrific and usually unforeseen charge of the animal, which may by a bold leap tear the hunter from the howdah, or stampede the elephant, or get through the barrier alive. It is a moment which calls for the utmost coolness and skill as well as courage, and the sport is never free from peril. The danger is multiplied by the various accidents possible. Even if the tiger is unable to spring upon the elephant, saddle-girths may break or howdahs may fall. Nine out of ten elephants, even if always stanch heretofore, will become panic-stricken and bolt, when the danger of their riders being dashed against a tree and killed is more imminent than any other. Thus unforeseen casualties are numerous, and the total tangible reward is only a hide, which after all may be of inferior beauty and value.

TIGER-LILY. See Lily.

TIGER-MOTH. A name applied on account of their coloration to certain moths of the family Arctiidæ, as *Arctia nais,* and especially to the Isabella tiger-moth (*Isia Isabella*), an American species, grayish yellow with black markings. The caterpillar is known as the 'woolly bear,' and is densely clothed with reddish brown and black hairs. It feeds upon a great variety of low-growing herbage. See Colored Plate of American Moths, under Moths.

TIGER-SHARK. The largest, fiercest, and most formidable of West Indian sharks (*Galeocerdo tigrinus*), brown in color, with numerous small dark spots which give the fish its name, but grow indistinct with age.

TIGER-SNAKE. An elapine, poisonous snake (*Hoplocephalus curtus*) of Australia. See Death-Adder.

TIGHE, tī, Mrs. Mary (Blachford) (1772-1810). An Irish poet. Her father, a clergyman, was a librarian in Dublin. In 1793 she married her cousin, Henry Tighe, a member of the Irish Parliament. Mrs. Tighe was greatly admired for her beauty and her charming poem, in Spenserian stanzas, *Psyche, or the Legend of Love* (privately printed in 1805). The poem was a version of the story of Cupid and Psyche in the *Golden Ass of Apuleius.* This and other poems were published in 1811, with a portrait after a painting by Romney.

TIG'LATH-PILE'SER. The Old Testament form of the name borne by several Assyrian kings, the Assyrian form of which is *Tukulti-apal-esharra,* 'My trust is the son of Esharra;' since son of Esharra (lit., the good house) is a designation of the god Ninib—a solar deity—the name is equivalent to 'My trust is Ninib.' Of the Assyrian kings bearing this name, the most important is Tiglath-pileser I., who began to rule about B.C. 1120. Under him the dominion of Assyria was considerably enlarged by conquests in districts embracing Northern Syria, Cappadocia, Armenia, Kurdistan, and Persia. He claimed to have conquered no less than forty-two countries, and in his days Babylonia was forced to acknowledge Assyrian supremacy. Twice he invaded the south and entered the city of Babylon itself. His activity in rearing temples and palaces was no less remarkable, and he devoted himself specially to the embellishment of the old city of Asshur on the Tigris, which he once more made the seat of government in place of Calah. Although he was able to hand over the succession to his son Asshur-bel-kela, his great empire was not maintained, and shortly afterwards a period of decay set in which appears to have lasted almost up to the days of the second Tiglath-pileser, whose reign may be placed about B.C. 950. Nothing is known of him beyond his name and titles. The third Tiglath-pileser, ruling from B.C. 745 to 727, was in some respects more remarkable than Tiglath-pileser I. Rising from obscurity, he either set on foot a rebellion against Asshur-Nirari III., or availed himself of an opposition that had sprung up against this King to seize the throne for himself. He assumed the name of Tiglath-pileser as King, his original name having been Pulu or Pul, by which he continued to be known in Babylonia and which is given to him likewise in the Old Testament (II. Kings xv. 19). To reinforce his position he proceeded to the south and brought to submission the Aramæan tribes, who had been causing the Babylonians considerable trouble. Securing in this way the good-will of the Babylonians, by whom he was hailed as a deliverer, he could devote himself to the troublesome neighbors in Media to the east of Assyria. Two expeditions were required before the pacification of the country was secured. Tiglath-pileser III. appears to have introduced the policy of planting

Assyrian colonies in hostile districts with a view of thus making Assyrian influence a more permanent factor than could be accomplished merely by military invasions. Successful also in breaking up a combination that had been formed against him in Ararat under the leadership of Sarduris II., aided by a group of allies in Asia Minor, he secured a large booty in a battle in which he claims to have captured no fewer than 72,950 soldiers of the enemy. He encountered more difficulty in quelling a revolt in Northern Syria in B.C. 742-740. As early as B.C. 739 there was a conflict between the Assyrians and a certain Azariah of Jaudi, and until recently it was supposed that this was none other than King Azariah of Judah, but chronological as well as other difficulties stand in the way of this identification, and it is more probable that the land Jaudi referred to is not Judah, but a district in Northern Syria. The King overthrew Azariah and his allies and again showed his administrative abilities by placing the hostile district, divided into small principalities, under Assyrian Governors. He enumerates in his inscriptions a long list of rulers of petty States in Asia Minor and Syria who brought him tribute, and among these we find Menahem of Samaria, the notice thus confirming the statement in II. Kings xv. 19-21.

In B.C. 734 Tiglath-pileser again proceeded to the West, being appealed to by Ahaz, King of Judah (II. Kings xvi. 7), to assist him against the combination formed by Pekah, King of Israel, and Rezin of Damascus. Rezin was defeated and fled to his capital, and while a portion of the Assyrian army laid siege to it, another section was sent to ravage and plunder the Syrian, Israelitish, and Philistine towns. In B.C. 732 Damascus fell and an Assyrian official was appointed Governor. Among those who hastened to pay homage to Tiglath-pileser, we find his vassal King Ahaz (or Jehoahaz as he is called in the Assyrian inscriptions) of Judah. This visit is the one referred to in II. Kings xvi. 10. Tiglath-pileser also claims to have deposed Pekah of Israel and to have put Hoshea in his place. According to the biblical statement (II. Kings xv. 30) Pekah was murdered in the course of a revolt instigated by Hoshea, who no doubt was abetted by the Assyrian King. Shortly after his successful campaign in Syria and Palestine, Tiglath-pileser was obliged to proceed once more against Babylonia, where trouble had broken out. Two years elapsed before he could take the decisive step of having himself crowned King of Babylonia. The ceremony took place on the Babylonian New Year's festival of the year B.C. 728. As King of Babylonia he assumed his original name of Pulu (identical with Parus in the Ptolemaic canon). Not long afterwards, in B.C. 727, he died, leaving his policy of political centralization to be carried on by his son Shalmaneser IV. Consult the Babylonian-Assyrian histories of Rogers, Winckler, Tiele, and Hommel.

TIGRA'NES (Lat., from Gk. Τιγράνης, Armen. *Tigran*). The name of several kings of ancient Armenia. The most famous was Tigranes the Great, who was born about B.C. 121. He was for many years a hostage at the Parthian Court, but was exchanged for seventy districts about 95, when he succeeded to the throne. He made an alliance with his father-in-law, Mithridates (q.v.), King of Pontus, against the Romans. He was at first successful, and about 83 he conquered Syria, later extending his power over much of Asia Minor, besides taking from the Parthians the provinces of Mesopotamia, Adiabene, and Atropatene. In 71 Mithridates fled to him for refuge from the Roman general Lucullus (q.v.). Refusing to give up the fugitive, Tigranes was attacked by the Romans, and was defeated in 69 at Tigranocerta, his newly founded capital, although a mutiny prevented Lucullus from following up his advantage. Three years later Pompius (q.v.) took the field against the Armenians, and in 64 after a long siege compelled Tigranes to surrender at Artaxata. He remained in possession of Armenia Major, however, on the payment of 6000 talents. In 55 he named his son Artavasdes co-ruler. The date of his death is uncertain.

TIGRÉ, tē-grā'. A division of Abyssinia (q.v.).

TI'GRIS (Greek, from the old Persian *tigra*, an arrow). One of the two large rivers which inclose the historic region of Mesopotamia, in Asiatic Turkey (Map: Turkey in Asia, M 6). It rises by two main headstreams in the mountains of Kurdistan, near the Euphrates. Thence it flows in a winding southeast course of about 950 miles till it joins the Euphrates at Korna to form the Shat-el-Arab, which after a short course flows into the Persian Gulf. The Tigris is a rapid and turbid stream. In its upper course it receives numerous tributaries from both sides. Below Mosul, however, the tributaries come nearly all from the east, the region between the Lignis and the Euphrates being here a desert overgrown with wormwood and similar scrub. Farther down the Tigris communicates across the desert with the Euphrates by a number of bayous or canals, some of which are dry the greater part of the year. At the confluence the Tigris, though shorter than the Euphrates, is more voluminous, and it is navigable for steamers to Bagdad. Thence smaller vessels proceed to Mosul, and above that city rafts descend from Diarbekir, almost at the source of the river. The rafts, however, are broken up at Mosul and transported back by camel. The main tributary of the Tigris is the Diyala, which joins it from the east, a short distance below Bagdad, and which is navigable for some distance by small vessels. Next to the Diyala, the largest affluent is the Greater Zab. Outside of the three cities mentioned the banks of the Tigris are very thinly populated. Among the remains of ancient cities on the banks of the Tigris are those of Nineveh, Seleucia, and Ctesiphon.

TILBURG, til'bōōrk. A manufacturing town in the Netherlands, Province of North Brabant, 36 miles southeast of Rotterdam, and 19 miles east of Breda (Map: Netherlands, D 3). The town has a new church in the Gothic style, and a cloth-hall, and is besides an important manufacturing centre, with more than 300 factories, most of them woolen and cloth mills, and tanneries. Population, in 1895, 36,275; in 1900, 40,628.

TIL'BURY FORT. A fortification in Essex, England, on the north bank of the Thames, opposite Gravesend, 30 miles below London (Map: England, G 5). Originally erected in the time of Henry VIII. as a block-house, it was converted (1667) into a regular fortification after the bold expedition of De Ruyter into the Thames and Medway, and has been greatly strengthened since 1861. Large docks comprising 588 acres, opened in 1886, have reclaimed the waste land formerly surrounding the fort.

TIL'DEN, SAMUEL JONES (1814-86). An American lawyer and statesman, born at New Lebanon, N. Y. He attended Yale College and the University of the City of New York, where he graduated in 1837; studied law, and in 1841 was admitted to the bar of New York City. As a lawyer he rose to the first rank. In 1846 he was a member of the State Legislature, in which he devoted his attention particularly to the subject of the State canals, and in the same year served as a member of the State Constitutional Convention. In 1867 he again sat as a delegate to the Constitutional Convention. Having been elected again to a seat in the Legislature, he took the lead in 1872 in the impeachment proceedings against Barnard and Cardozo, two of Tweed's corrupt and subservient judges. He contributed to the exposure of the frauds of the Tweed Ring, and took the leading part in the prosecution of its guilty members. By 1868 he had become the acknowledged leader of the Democratic Party in New York, and his activity in overthrowing the Tweed Ring led to his election in 1874 as Governor of New York. His administration (1875-76) was marked by economy in the management of the State canals. In June, 1876, he was nominated by the Democratic National Convention at Saint Louis for President of the United States, and in the ensuing Presidential election received a majority of the popular vote, and according to the final count came within one vote of receiving a majority of the electoral vote. Because of alleged frauds in the elections of Louisiana, South Carolina, and Florida, the votes of those States, which were nominally given for the Democratic Party and which would have turned the election in Tilden's favor, were claimed by the Republicans, and the excitement which followed threatened to disturb the peace of the country. Finally Congress created an Electoral Commission (q.v.), consisting of five justices of the Supreme Court, five Senators, and five Representatives, to settle the dispute, and by a strict party vote of 8 to 7 it gave its decision in favor of Tilden's opponent, Rutherford B. Hayes (q.v.). Tilden thereupon promptly requested his friends to accept the decision with good grace, though many of his supporters continued to believe and to assert that he had rightfully been elected President. In 1880 and in 1884 the Democratic Party wished to nominate Tilden again for the Presidency, but each time he refused to be a candidate. He lived his remaining years in retirement near Yonkers, N. Y., dying on August 4, 1886. He bequeathed the greater portion of his fortune of about $5,000,000 to philanthropic purposes, chiefly for the establishment and endowment of a public library in the city of New York. The will was contested and only about $2,000,000 went to the establishment of the Tilden Foundation of the New York Public Library (q.v.). Tilden's biography was written by John Bigelow (New York, 1895), and his writings were edited by the same author (2 vols., 1885).

TILE (AS. *tigol*, *tigele*, from Lat. *tegula*, tile, from *tegere*, to cover). Properly a piece of material for covering a roof, but limited to harder materials than wood. Slate, marble and other hard stones which can be cut into thin slabs and resist ordinary breakage have been used for tiles. Ordinary roof tiles are of earthenware and these may be perfectly flat and used to shed the water by being laid over one another on a sloping surface, exactly as shingles are laid. The other kind of roof tile is that which is made with ridges by the use of two kinds of tile, those which are flat and those which are curved and laid with the convex side uppermost to cover the joints between the flat ones. There is also a kind of tile which has the flat and the raised ridge-like convexity cast or molded in the same piece of ceramic ware. From the use of the term to cover many different kinds of roofing it has come to have two different meanings. First, any flat slab, if small and forming one of many pieces used to cover a large surface, is a tile; second, the different ceramic wares used in building and in all kinds of engineering work, drainage, and the like are called tiles.

The decorative value of tile is seen chiefly in flooring. The tile floors of the Middle Ages were composed of earthenware tiles, each of which is complete and of one color, or incised with a pattern in such a way that a different-colored clay may be inlaid. In the south of Europe wall tiles were much used according to a fashion always prevalent in the East, and were taken up by the Moslem peoples. These tiles in Cairo, Damascus, and other Levantine cities are of such beauty that squares composed of nine or sixteen are often sold for many hundreds of dollars; and even these are admittedly inferior to the tiles of the Persian mosques. In Spain a modification of this tendency showed itself in the production of tiles of slight relief in the outlines of decorative scrolls and the like, so that the brilliant color with which these scrolls were painted is incrusted, as it were, between slight ridges raised in the clay. These tiles, unfit for floors, are very decorative when used for the linings of walls. The Gothic revival in England between 1840 and 1870 brought with it a strong movement to restore these appliances of decorative buildings; and many tile floors were designed and made in mediæval taste. In consequence of this the earthenware tile industry became an extensive one in Great Britain and for many years the greater number of tiles imported into the United States came from England. Tiles of much greater refinement and beauty were made on the Continent, especially in France. Other tiles have been made with heads, human figures, and even groups in slight relief, the ornamentation being obtained by sculpture rather than color. In very recent times the chief makers of decorative pottery have tried the adornment of tile with good results. There has grown up among these designers a certain freedom of color composition which no other trade seems to have achieved.

Clay tiles may be divided broadly into solid and hollow, the former being thin and, except for some roofing tiles generally flat, while hollow tiles have a great variety of thickness and shape. In the preparation of the clay for molding some one or more of the processes described under CLAY (paragraph on *Clay Mining* and *Working*) are employed, varying with the class of clay and the final product. For tile-burning see KILN; TERRA COTTA.

ENCAUSTIC TILES, for floors, walls, and other purposes, are decorative tiles in which the main body is of one color of clay and a pattern is inlaid in a contrasting color of clay. The term is a mere trade name, without special significance. Those which are small, unglazed floor tiles in plain colors, the design being made by the combination of tiles of different colors and shapes, are commonly called mosaic tiles. Glazed porcelain tiles bearing fixed designs in vitrifiable colors are also sometimes called encaustic tiles. The famous Dutch tiles are simply enameled earthenware, usually in blue, but sometimes in colors, and generally with Scriptural subjects for the design. They were first made in the Netherlands during the Renaissance period.

FLOOR TILES are now made by machinery in metal dies, in which they are subjected to heavy pressure. The clay is first prepared as for ordinary ceramic work and then dried again and ground in powder. *Wall tiles* are made with the back surface broken by 'undercutting,' so the cement may have a better hold. They usually have a highly glazed surface. Floor tiles are generally preferred unglazed. They are made from a mixture of barytes and very hard clay, which vitrifies throughout its surface. When the tiles are to be figured the old process of filling in the embossed surface with liquid clay has been replaced by a method of dry filling. The pattern is produced by the use of brass plates, an eighth of an inch thick, a separate one being used for each color. Thus, for an ornament in red and white on a blue ground, one plate is perforated so as to enable the red portion of the clay power to be filled in, another is cut for the white portion, and a third for the blue ground. When all are filled up the tile is pressed in a screw-press and fired as in the ordinary plain tile.

FIREPROOFING, STRUCTURAL, OR HOLLOW TILES are rapidly growing in use (see FIREPROOF CONSTRUCTION), particularly for fitting around steel columns and girders forming partitions, floor arches, and ceilings. Their lightness is greatly in their favor. They are divided into three classes: Dense, porous, or terra cotta lumber, and semi-porous. *Dense tiles* are prepared for molding much like terra cotta. They are given heavy pressure and a long burning, and are sometimes made from fire clay. *Porous tiles* are made by mixing one part by bulk of soft wood-sawdust or finely cut straw with two parts of clay, passing the mixture through a disintegrator or cutter, and then between two sets of corrugated rolls, one below the other. From the rolls conveyors take the mixture to the tile machines described below. The subsequent burning destroys the sawdust or straw, leaving a very porous tile into which nails may be driven, or which may be cut with a saw; hence the name, terra cotta lumber. *Semi-porous tiles* are made of good fire clay containing 60 per cent. of silica, calcined fire clay, and coarsely ground bituminous coal. These materials are mixed, molded, and burned much like porous tiles.

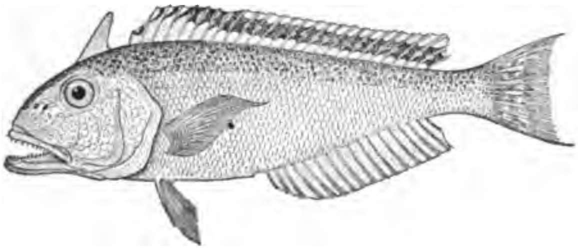
HOLLOW TILE MACHINES are of various forms according to the character of the clay. The tempered clay is forced through forms and around plugs. The forms give the outer and the plugs the inner shape to the tiles. The plugs are of metal, with their front ends just inside the form. Plungers force the clay over or around the plugs, then through the forms. The continuous shapes are separated by wires or knives. Some of the special forms require partial hand-shaping.

ROOFING TILES, when of clay, are something like terra-cotta (q.v.) in their composition and manufacture. They are made in various colors and shapes, the shapes being governed largely by the kind of vertical joints employed.

BIBLIOGRAPHY. Ome, *Les carrelages émaillés du moyen âge et de la renaissance* (Paris, 1859); Bourgoin, *Les arts arabes. Architecture* (ib., 1873); Prisse d'Avenues, *L'art arabe d'après les monuments de Kaire, etc.* (ib., 1877); Meurer, *Italienische Majolikafliesen, etc.* (Berlin, 1881); Jacobstal, *Süditalienische Fliesenornamente* (ib., 1886); Knochenhauer, *Niederländische Fliesenornamente* (ib., 1888); Foy, *La céramique des constructions* (Paris, 1883); Sparkes and Gandy, *Potters, Their Arts and Crafts* (New York, 1899); Freitag, *The Fireproofing of Steel Buildings* (ib., 1899).

TILEFISH (name coined from penultimate syllable of generic name). A deep-sea fish (*Lopholatilus chameleonticeps*) chiefly remarkable for its strange history. It was accidentally discovered in large numbers in 1879 by fishermen trawling for cod south of Nantucket, and was found again in 1880 and 1881. In the spring of 1882 shipmasters reported that an immense area of ocean surface about 300 miles south of Long Island was covered with many millions of floating fish, dead or dying, chiefly tilefish, which showed no marks of injury or disease. Verrill and other ichthyologists, judging by various circumstances, explained this as the result of an incursion of cold water, forced by the heavy northerly gales of that spring, into the warm area of the Gulf Stream.

This fish represents a genus of the family Malacanthidæ, which includes several edible fishes of the seas of both sides of tropical America, one of which, the blanquilla or 'whitefish' (*Caulolatilus princeps*), is a well-known food fish of southern California. The tilefish is a large, big-headed, brilliantly colored, active fish, sometimes 40 pounds in weight, but ordinarily from 10 to 20 pounds. It is characterized by a high adipose protuberance upon the nape in advance of the long dorsal fin, and by a short barbel at the angle of the lips on each side. Its flesh was found to be excellent, and the United States Fish Commission made great efforts to learn where it might be found, but the disaster of 1882 seemed to have wholly exterminated the species. Some ten years later an occasional one was captured, and investigation of the edge of the continental plateau was resumed by the Fish Commission. It was finally determined that the area of their distribution extends along a band of sea-bottom from about 39° N. latitude southward between 69° and 73° W. longitude to an unknown distance, in water from 60 to 80 fathoms deep, wherever the water has a temperature not colder than 50° F. Increasing catches were made in 1900, 1901, and 1902.


THE TILEFISH.

Consult Collins, "History of the Tile Fish," in *Annual Report of the United States Commissioner of Fish and Fisheries for 1882* (Washington, 1884); Lucas, *Annual Report of the United States National Museum for 1889* (Washington, 1891); Bumpus, "The Reappearance of the Tilefish," in *Bulletin of the United States Fish Commission* (Washington, 1899).

TILGHMAN, til′mȧn, Matthew (1718-90). An American patriot, born in Queen Anne County, Md. He was early engaged in the Indian wars, and was elected a delegate to the Maryland Assembly, where he sat continuously until the formation of the State Government, February 5, 1777, and was Speaker of the House in 1773-75. From 1774 until the establishment of the State Government he was president of the convention which exercised the chief authority. He was also head of the Committee of Correspondence of the Council of Safety, and of the delegation to the Continental Congress. He was a strong advocate of independence, but was prevented from signing the Declaration of Independence by being called home to preside over the convention to frame a State constitution. He was an earnest, enthusiastic patriot and did much for the American cause in Maryland.

TILGHMAN, Tench (1744-86). An American soldier, born near Easton, Md. Prior to the Revolution he was engaged in mercantile pursuits at Philadelphia, but early in 1775 entered the American army as lieutenant in an infantry company, and in July was sent as a special commissioner to treat with the Iroquois. From August, 1776, until the close of the war, he was an aide and military secretary of General Washington, participating in all the battles of the main army during this period; and in October, 1781, carried to Congress the news of Cornwallis's surrender, covering the distance from Yorktown to Philadelphia in four days. In May, 1781, he was made a lieutenant-colonel, to take rank from April 1, 1777, and in October, 1781, Congress voted him "a horse properly caparisoned and an elegant sword, in testimony of their high opinion of his merit and ability." After the war he removed to Baltimore, where he died. Consult *Memoir of Tench Tilghman* (Albany, 1876).

TILGNER, tĭlk′nẽr, Viktor (1844-96). An Austrian sculptor, born in Pressburg. While still a pupil of Franz Bauer and Joseph Gasser at the Vienna Academy, he was commissioned to execute the bust of Bellini for the opera house and the statue of Duke Leopold VI. for the arsenal. Influenced by the French sculptor Déloye, who was engaged in Vienna on work for the exposition in 1873, Tilgner adopted an exceedingly dashing and lifelike style and attracted wider notice with his portrait bust of Charlotte Wolter (1873). After a visit to Italy in 1874 he produced the group of "Triton and Naiad" (Volksgarten, Vienna), and among many excellent portrait busts and statues those of Emperor Francis Joseph, Crown Prince Rudolf, Heinrich Laube, Rubens (Künstlerhaus, Vienna). Other noteworthy works include fountain groups for the Imperial villas at Ischl and in the Tiergarten near Vienna, the heroic-sized figures of "Phædra" and "Falstaff" (Burgtheater, Vienna), the bust of Liszt (1893, Oedenburg), the statues of Mozart (1896) and Makart (1898), both in Vienna, and a number of successful polychrome busts and genre statuettes. A selection of his works, in 60 heliotype plates, was published by Ilg (Vienna, 1896-97).

TILIACEÆ (Neo-Lat. nom. pl., from Lat. *tiliaceus*, relating to the linden, from *tilia*, linden-tree, Gk. *πτελέα*, *ptelea*, Arm. *t'eλi*, elm). The Linden Family. A natural order of dicotyledonous trees and shrubs, and a few herbs, mostly natives of the tropics, chiefly in Asia and Brazil. A few are found in the temperate parts of the Northern Hemisphere. They have simple, alternate leaves with stipules, and axillary flowers. The calyx is usually of four or five sepals; the corolla, of four or five petals, or sometimes wanting. The stamens are generally numerous, the outer ones sometimes abortive and petal-like. The ovary is composed of 2 to 10 carpels; there is one style, and the stigmas are equal in number to the carpels. The properties of the order are generally mucilaginous and wholesome, the bark fibrous.

The Tiliaceæ yield valuable light timber (see Grewia), jute or corchorus (q.v.), and other fibres. The chief genera are Tilia, Grewia, Triumfetta, Corchorus, and Sparmannia.

TILLAGE (from *till*, AS. *tilian*, *teolian*, Goth. *tilōn*, OHG. *zilōn*, *zilēn*, Ger. *zielen*, to aim, strive for; connected with Goth. *tils*, good, AS. *til*, goodness, OHG. *zil*, Ger. *Ziel*, aim, goal). The process of stirring and mixing the soil for the purpose of increasing its productiveness. The operations of plowing, harrowing, spading, hoeing, etc., constitute tillage. There are three distinct classes of tillage: (1) surface tillage brought about by such implements as harrows, cultivators, and weeders; (2) sub-tillage, such as is secured by sub-soiling; and (3) intertillage, such as is carried on while the soil is occupied by a crop. Pulverizing the soil by tillage not only favors the root growth of plants but improves the moisture and other physical conditions of the soil, promotes weathering and disintegration, which set plant food free, supplies conditions favorable to the activity of beneficial organisms in the soil (nitrification, q.v.), and destroys weeds (and in many cases injurious insects).

TILLEMONT, têl′môɴ′, Sébastien le Nain de (1637-98). A French ecclesiastical historian, born in Paris. He was educated at Port-Royal, under the Jansenist influence, and was ordained a priest in 1676, mainly at the persuasion of his friend Le Maistre de Sacy, who had long been his spiritual adviser. In 1681 Tillemont made a visit to Holland and Flanders, for the purpose of seeing Arnauld and other Jansenist refugees. He had worked meanwhile on his Church history. To avoid the opposition of the censor, he separated from the Church history the history of the emperors, which he was enabled to print as a distinct work, without referring it to the censorship, under the title *Histoire des empereurs*, etc. (1691-1738). In 1693 the first volume of the Church history appeared under the title *Mémoires pour servir à l'histoire ecclésiastique des six premiers siècles*, complete in 16 volumes (1693-1712). The *Histoire des empereurs* comprises all the reigns from Augustus to Anastasius (518); the *Histoire ecclésiastique* comes down to about the same period. Both are laborious compilations from the original writers. He was also author of *Vie de Saint-Louis* (new ed., 1847-51).

TIL'LEY, Sir Samuel Leonard (1818-96). A Canadian political leader, born at Gagetown, New Brunswick. He took a great interest in the temperance question, and in 1850 he was elected to the New Brunswick Legislature by the Liberals, and there played an important part until 1865. He advocated Canadian union in 1864, and in 1866 succeeded in carrying New Brunswick for that cause. He was a delegate to the Westminster Conference where the British North American Act (1867) was drawn up, and on the establishment of the new Government he was elected to the Dominion House of Commons, and appointed Minister of Customs. Afterwards he held the portfolios of Public Works and Finance, and in 1873 he became Lieutenant-Governor of New Brunswick. In 1878 he was again elected to the House of Commons and again appointed Minister of Finance. In 1885 he retired from Dominion politics, but accepted a reappointment as Lieutenant-Governor of New Brunswick, an office which he held until 1893.

TILL'MAN, Benjamin Ryan (1847—). An American politician, born in Edgefield County, S. C. He was educated at Bethany Academy, became a planter, and interested himself in the development of industrial and technical education in South Carolina. He became the recognized leader of the farming element in the Democratic Party in South Carolina, received the support of the 'Farmers' Alliance,' and in 1890, as the Democratic candidate, was elected Governor of the State. He was rëelected in 1892, and in 1895 was elected United States Senator, being rëelected to that office for a second time in 1901. His speeches against President Cleveland in 1895-96 in the Senate won him the name of 'Pitchfork' Tillman. He was active in both 'free-silver' campaigns, in 1896 and 1900, as one of the most radical supporters of the candidacy of W. J. Bryan. An assault which he made on his colleague, J. L. McLaurin, in the Senate, February 22, 1902, led to the censure of both by that body.

TIL'LO, Alexei Andreyevitch (1839-1900). A Russian general and scientist, distinguished for his work in geodesy, meteorology, terrestrial magnetism, hypsometry. He was born at Kiev and attended the Russian military schools. He studied at the Astronomical Observatory at Pulkova, receiving a thorough training in geodesy under Struve and Doellen, and it was chiefly through his efforts that the Imperial Department of Agriculture organized expeditions to study the sources of the principal Russian rivers. He was an indefatigable observer, explorer, author, and investigator and the most prominent geographer of his day in Russia. His published works include magnetic and meteorological charts and the physiometric charts of Russia.

TILLODONTIA, tĭl'lō-dŏn'shĭ-ȧ (Neo-Lat. nom. pl., from Gk. *τίλλειν*, *tillein*, to pluck, tear + *ὀδούς*, *odous*, tooth). An extinct suborder of early Tertiary fossil mammals supposed to be ancestral to the modern rodents. The principal genera, Esthonyx, Tillotherium, Stylinodon, Dryptodon, and Anchippodus, are found in the Eocene and Miocene beds of the Western United States. See Rodentia.

TIL'LOTSON, John (1630-94). Archbishop of Canterbury. He was born in Sowerby, in Yorkshire, in 1630, the son of a clothier, who was a zealous Independent. He was educated at Clare Hall, Cambridge. He was a preacher in 1661—attached apparently to the Presbyterian party in the Church of England, for at the Savoy Conference (q.v.) he was present as an auditor on the Presbyterian side; but he submitted at once to the Act of Uniformity (1662), and in 1663 he was appointed to the rectory of Keddington in Suffolk, and almost immediately after was chosen preacher at Lincoln's Inn. In 1666 he published *The Rule of Faith*, in reply to a work by an English clergyman named Sargeant, who had gone over to the Roman Catholic Church. He was made a prebendary of Canterbury in 1670 and dean in 1672. With Burnet, he attended Lord Russell during his imprisonment for complicity in the Rye House Plot, and on the accession of William III. rose high into favor. In March, 1689, he was appointed clerk of the closet to the King; in November, made Dean of Saint Paul's; and in April, 1691, was raised to the see of Canterbury, vacant by the deposition of Sancroft (q.v.), after vainly imploring William to spare him an honor which he foreboded would bring him no peace. Nor was he mistaken in his painful presentiment. The non-juring party pursued him to the end of his life; but he bore their animosity without complaint or attempt at retaliation. A collected edition of his *Sermons*, in 14 volumes, was published after his death by his chaplain, Dr. Barker (London, 1694), and has been frequently reprinted. The best edition of his sermons and other works is by Dr. T. Birch, who also wrote his *Life* (London, 1752).

TILLY, Johann Tserklaes, Count of (1559-1632). A Catholic general in the Thirty Years' War. He was born at the Castle of Tilly, in Brabant, in 1559. He received his military training in the Spanish armies, fought against the Turks in Hungary, and in 1610 was selected by Duke Maximilian of Bavaria to reorganize his army. At the outbreak of the Thirty Years' War (q.v.) he was placed in command of the forces of the Catholic League and on November 8, 1620, won the battle of the White Hill, near Prague, which put an end to the short reign of Frederick of the

Palatinate in Bohemia. He then carried on the struggle in the Palatinate, was defeated by Mansfeld and the Margrave of Baden-Durlach at Wiesloch (April 27, 1622), but gained a decisive victory over the latter at Wimpfen (May 6th) and defeated Christian of Brunswick at Höchst (1622) and Stadtlohn (1623). For these services he was created a count of the Empire. He defeated Christian IV. of Denmark at Lutter (August 27, 1626), and coöperated with Wallenstein in bringing about the complete triumph of the Catholics in this second phase of the Thirty Years' War. When the influence of the League secured Wallenstein's retirement (1630), Tilly succeeded to the command of the Imperial forces, and took by storm the town of Magdeburg (May 20, 1631). The atrocities which the Croats and Walloons of his army perpetrated on this occasion form a stain upon a character that was remarkable in that age for honesty and loyalty to conviction. The capture of Magdeburg was Tilly's last triumph. Gustavus Adolphus completely routed him at Breitenfeld (September 17, 1631). In April, 1632, the Swedish King forced the passage of the river Lech in Tilly's front after a desperate conflict, in which Tilly was mortally wounded. He was removed to Ingolstadt, where he died. Consult: Villermont, *Tilly* (Tournay, 1859); Klopp, *Tilly im Dreissigjährigen Kriege* (Stuttgart, 1861), both written from the Catholic point of view; and Wittich, *Magdeburg, Gustav Adolf und Tilly* (Berlin, 1874).

TIL′SIT. A town of Prussia, in the Province of East Prussia, on the left bank of the Memel or Niemen, sixty-one miles northeast of Königsberg (Map: Prussia, J 1). It stands in a fruitful district. It has broad streets and a cleanly appearance. It has paper, sugar, and oil mills, iron foundries, machine shops, distilleries, chemical establishments, breweries, and shoddy mills. Population, in 1900, 34,539.

At Tilsit, on a raft in the middle of the Niemen, occurred, June 25, 1807, the celebrated meeting between Napoleon and Alexander I. of Russia, following the defeat of the Russian forces at Friedland (q.v.). On July 7th peace was concluded at Tilsit between France and Russia and on the 9th between France and Prussia. The latter was stripped of her possessions west of the Elbe and of the Polish territories acquired in 1793-95, out of which Napoleon created the Duchy of Warsaw. Danzig was made a free city. Prussia joined the Continental System and closed its ports to English vessels. Its army was reduced to 42,000 men, and until the payment of a heavy indemnity a number of the chief strongholds were to remain in the hands of the French. A secret agreement between France and Russia provided for the imposition by force of the Continental System on Portugal, Austria, and the Scandinavian countries. Practically at Tilsit the French and Russian monarchs divided between them the mastery in Europe, France remaining the arbiter in West and Central Europe, while Russia was given a free hand in Sweden and Turkey.

TIL′TON, Theodore (1835—). An American journalist, poet, and novelist, born in New York. He graduated at the College of the City of New York in 1855, and was an editor of *The Independent* from 1856 to 1871, and of *The Golden Age* (1871-74). In 1874 he brought criminal charges against the Rev. Henry Ward Beecher (q.v.), whom he accused of improper relations with his wife. Afterwards he attracted attention as a platform speaker, chiefly in behalf of woman's rights. After 1883 he lived in Paris. His books include: *The Sexton's Tale and Other Poems* (1867); *Sancta Sanctorum, or Proof Sheets from an Editor's Table* (1870); *Tempest-Tossed*, a romance (1874); *Thou and I*, verses (1880); *Swabian Stories*, ballads (1882); *The Chameleon's Dish* (1883) and *Heart's Ease* (1894), volumes of verse. His *Complete Poetical Works* appeared in 1897.

TIMÆ′US (Lat., from Gk. Τιμαιος, *Timaios*) (c. 352-256 B.C.). A Greek historian; son of Andromachus, tyrant of Tauromenium, in Sicily. He was banished from Sicily by Agathocles, and passed most of his life in Athens. His chief work, a *History of Sicily* in sixty-eight, or, according to others, thirty-eight books, embraced the period from the earliest times to B.C. 264. Polybius and others, notably Diodorus Siculus, pronounce him unfit for writing history on account of his "lack of critical acumen, malignity, and tendency to superstition." But, although most of these charges are founded on truth, Timæus's deficiencies have probably been exaggerated, since modern critics and most of the ancients, including Cicero (*De Oratore*, ii. 14), praise his general knowledge and his accuracy in indicating the chronology of the events which he describes. He is said to have introduced the practice of recording events by Olympiads. For the fragments, consult: Müller, *Fragmenta Historioorum Græcorum* (Paris, 1841).

TIMARU, tê-mä′rōō. A seaport of Geraldine County, South Island, New Zealand, on the east coast, 100 miles southwest of Christchurch by rail, and the junction of a line to Fairlie (Map: New Zealand, C 6). Agricultural machinery and implements are manufactured; it has a fine harbor. Population, in 1891, 3668; in 1901, 6424.

TIMBER (AS. *timber*, OHG. *zimbar*, timberwork, room, Ger. *Zimmer*, room; connected with Lat. *domus*, Gk. δόμος, OChurch Slav. *domŭ*, Skt. *dama*, house). In law, such trees as are suitable for building purposes. Timber trees belong to the owner of the land, both when standing and fallen, unless converted into lumber in a convenient form for transportation. Therefore, timber will pass with the land under a conveyance, and is included in a mortgage on the land, without being specifically mentioned. A tenant is not legally entitled to cut more timber than is necessary for the purposes for which he hired the land, unless under special agreement. The term 'timber' is also applied to large pieces of lumber, suitable for the framework of buildings, bridges, etc., as distinguished from shingles, lath, etc. See Real Estate.

TIMBER. See Lumber Industry.

TIMBER PRESERVATION. See Forestry.

TIMBUKTU, tĭm-bụk′tōō, or **TIMBUCTOO.** A town of Africa, in the first of the three Military Territories of French Sudan (q.v.), situated 9 miles north of the Niger, in about latitude 16° north, and longtitude 5° west (Map: Africa, D 3). The climate is unhealthful. The town, near the southern borders of the Sahara desert, lies between a rolling table land on the north and the swamps of the Niger. It has flat, windowless, clay houses; its streets are of sand and gravel. It was largely in ruins when taken by the French. They have, however, energetically begun introducing improvements, and new streets and European churches and schools have been constructed. Timbuktu is fortified. There is also a fortress at Kabara on the Niger. There are two important and handsome mosques. Timbuktu is notable for its commerce, and is the focus of the caravan trade in West-Central Africa. The annual value of the transit trade alone is put at $4,000,000. Gums and rubber are perhaps the leading articles. Gold, ivory, wax, salt, hardware, beads, and cheap cloth are also prominent items. The trade is chiefly by barter. The few local manufactures include cottons, leather articles, and pottery. French goods and money are replacing those of other countries. Timbuktu is a centre of Mohammedan learning and has a large Moslem library. The population, which has greatly diminished in recent times, is about 10,000. The town was founded in 1077 by the Tuareg tribe. It passed through different hands, began to be a place of commercial importance in the sixteenth century, and was seized by an army from Morocco in 1591. The Fulahs drove out the Moors early in the nineteenth century. Timbuktu was first visited by a European in 1826—Major Laing, an Englishman. From 1844 to 1846 it was again in the hands of the Tuaregs. In 1863 Ahmed el-Bathai drove out the Fulahs for the last time. The town passed into the possession of the French in 1894. Consult: Lenz, *Timbuktu* (Leipzig, 1892); Dubois, *Timbuctoo the Mysterious* (London, 1896); Toutée, *Du Dahomé au Sahara* (Paris, 1899).

TIM'BY, THEODORE RUGGLES (1822—). An American inventor, born in Dover, N. Y. In 1841 he prepared a model of a revolving battery which he submitted to the military authorities in Washington, and from which he subsequently developed a metallic revolving fort to be used on land and water, and for this in 1862 he obtained a patent for a revolving tower for defensive and offensive warfare. In consequence of this patent he received a royalty of $5,000 in 1862 for each turret constructed by the builders of the *Monitor*. His other inventions include a method for firing heavy guns by electricity (1861); a cordon of revolving towers across a channel (1862); a mole and tower system of defense (1880); a subterranean system of defense (1881); and a revolving tower and shield system (1884), for all of which he obtained patents.

TIME (AS. *tima;* connected with *tid*, OHG. *zit*, Ger. *Zeit*, time, Eng. *tide*, Skt. *a-diti*, boundless). In the philosophical sense, a term used in the description of the succession of phenomena. Time has been considered by some philosophers to be an illusion; by others to be a confused idea; by others again a form of phenomena, but not a characteristic of ultimate reality; by others to be real but with a qualified sort of reality; by others to be an unqualifiedly real characteristic of the ultimately real world; and by others to be a reality which exists independently of the timed world of objects. For reasons given in the article on SPACE (q.v.), the most acceptable view is that time has no independent existence, as if it were a kind of vessel whose parts appeared in succession, but that it is real in the sense that the ultimately real world is timed. The question of the infinity of time is to be solved in the same way as that concerning the infinity of space.

In its legal aspect, the meridian of the sun is the generally recognized standard of time, but where persons enter into legal relations expressly with reference to some arbitrary system, as that adopted by railroads for their convenience, the courts will apply the standard contemplated by the parties, in case of a controversy. In computing a period of time from a certain day, the general rule is to exclude the first day and include the last day of the count. This rule may be disregarded if it will best effectuate the intention of the parties to an agreement. It is generally held that a policy of insurance includes the last day of the period named therein. In many States Sunday, or other *dies non*, is included in the computation of a number of days if they exceed a week, that is, seven days, but excluded if less than seven days. In some States a *dies non* is included unless it would be the last day of a period. See DIES NON; MONTH; DAY.

In music, time is the division of a measure into the fractional parts of a whole note. The sign which indicates the character of the subdivision, and which consequently regulates the rhythm of the movement, is called the time-signature. This is generally a fraction ($\frac{2}{4}$, $\frac{3}{4}$, $\frac{6}{8}$, etc.) placed after the clef at the beginning of a movement. In the fraction the lower figures represent the kind of notes to be used as time standards, while the upper figure shows how many of them are to be given in a bar. There are two general classes of time, duple and triple; in the former, the number of beats in a bar is divisible by two; in the latter, by three. Common time, so called, is $\frac{4}{4}$ and is represented by the sign C. Compound duple time and compound triple time differ only from their originals in that each beat (containing a dotted note or its equivalent) is divisible by three. See RHYTHM; TEMPO.

TIME, RECKONING OF. See INTERNATIONAL DATE LINE; HOUR; DAY; TIME, STANDARD.

TIME, STANDARD. The time in common use for regulating the ordinary affairs of life. It is derived from the sun. Leaving out of account small irregularities of the solar motion that are of no consequence for our present purpose, when that celestial body is on the meridian of any place we call the time at that place 'noon' or twelve o'clock. (See EQUATION OF TIME.) It follows that when it is noon at any given place it is similarly noon at all other places having the same meridian, and at places having a different meridian it is either forenoon or afternoon. In fact, as the sun rises in the east and sets in the west, it is evident that when it is crossing the meridian of any place it must have already passed that of neighboring places to the eastward, and not yet have reached that of neighboring places to the westward. In other words, when it is noon in the given place it is already afternoon in places to the eastward, and still forenoon in places to the westward. The farther east one travels, the later is the local time; and this gives rise to the rather perplexing time differences so familiar to travelers.

In the case of railroads this matter of time differences has caused especially confusing complications. It was formerly customary for a road to use throughout large sections of its territory the local time of one of the principal cities through which it passed. The result was that when two railroads met in some smaller town, it happened not infrequently that they were running under widely different time systems. As many as five different kinds of time have been thus simultaneously in use in a single town.

It was the need of an international standard of time that led to the Prime Meridian Conference (q.v.) at Washington, 1882. This recommended the use of the Greenwich civil time, reckoned from zero up to 24 hours. In accordance with this resolution, and to remedy the difficulty mentioned above, the United States and Canada selected a series of standard meridians, differing in longitude from that of Greenwich, England, by exact multiples of 15°. October 18, 1883, a convention was called by W. F. Allen, Secretary of the General Railway Time Convention, which decided on the introduction of standard time to take effect November 18, 1883, and on that day the change was made without any difficulty.

Now 15° of longitude corresponds exactly to one hour of time difference, and therefore the local times of the several standard meridians differ from Greenwich by an even number of hours without fractional minutes and seconds. In the United States the standard time meridians are those whose longitudes are west of Greenwich 60°, 75°, 90°, 105°, and 120°. The times of these meridians are respectively 4 hours, 5 hours, 6 hours, 7 hours, and 8 hours earlier than Greenwich time, because the sun, in traveling across the sky from east to west, passes the Greenwich meridian before it reaches the American meridians. The time of the 60th meridian is called *Colonial*, that of the 75th meridian *Eastern*, that of the 90th *Central*, that of the 105th *Mountain*, and that of the 120th *Pacific* time. The limiting lines of the time-zones have been so drawn arbitrarily that they never divide any town. Where such a division is theoretically unavoidable, the dividing line for actual use is drawn on the map with a crook in it, so as to put the whole town on one side of the line.

TABLE OF THE WORLD'S TIME STANDARDS

COUNTRIES	Hrs. fast of Greenwich Time	Time of Adoption
Belgium	0	May, 1892
Holland	0	May, 1892
Spain	0	January, 1901
Germany	1.00	April, 1893
Italy	1.00	November, 1893
Denmark	1.00	January, 1894
Switzerland	1.00	June, 1894
Sweden	1.00	January, 1895
Austria (railways)	1.00	
Cape Colony	1.30	1892
Orange River Colony	1.30	1892
Transvaal	1.30	1892
Natal	2.00	September, 1895
Turkey (railways)	2.00	
Egypt	2.00	October, 1900
West Australia	8.00	February, 1895
Japan	9.00	1896
South Australia	9.30	May, 1899
Victoria	10.00	February, 1895
New South Wales	10.00	February, 1895
Queensland	10.00	February, 1895
New Zealand	11.00	February, 1895

The resolutions of the Washington Conference were not so favorably received on the Continent. The introduction of the time of the 15th meridian east of Greenwich for the Austrian railways was proposed by Schram in 1886. In 1889 the matter was brought before the German Railway Union and the German Reichstag. Belgium and Holland were, however, the first Continental nations to adopt standard time, and other countries followed rapidly, as shown in the preceding table.

BIBLIOGRAPHY. Jacoby, *Talks by an Astronomer* (New York, 1902); Schram, "The Actual State of the Standard Time Question," in *Observatory*, vol. iii. (London, 1890).

See DAY; MONTH; YEAR; INTERNATIONAL DATE LINE; HOROLOGY; CLOCK.

TIM'ELI'IDÆ (Neo-Lat. nom. pl., from *Timelia*, from the East Indian name). An assemblage of passerine birds resembling thrushes in a general way, which has been formed as a sort of 'catch-all' to contain many genera difficult of definite assignment elsewhere. All are birds of the Old World, and most of them belong to the Oriental and Ethiopian regions, and are denizens of woods, jungles, and rough mountains. The most distinctive timeliines, perhaps, are the 'babbling-thrushes' of the genera Timelia, Pomatorhinus, Orthonyx, and their allies, and the 'hill-robins' of the genus Liothrix.

A TIMELIINE TYPE.

The slaty-headed babbling thrush (*Pomatorhinus schisticeps*) of the Himalaya Mountains.

TIMES, THE. A famous daily newspaper of London, England. Its publication really began January 18, 1785, with the first number of *The London Daily Universal Register*, the present name being first applied to the issue of January 1, 1788, by its founder, John Walter (1735-1812). The paper has ever since been managed and controlled by the descendants of the first John Walter, his successors being John Walter (1776-1847), John Walter (1818-94), and Arthur Fraser Walter (1846—). Under their skillful management, with the assistance of some of the ablest journalists the world has known, *The Times* has achieved a reputation for unequaled journalistic enterprise and unusual political influence. It has also been a pioneer in the adoption of new inventions in printing and publishing. Among improvements of the latter sort, one of the greatest was the introduction of steam printing presses, the use of which was begun with the issue of November 29, 1814, in spite of strong opposition from the employees. Subsequent experiments in *The Times* office led to the perfection of stereotyping, to the introduction of the Walter press, from which by the use of stereotype plates the paper was printed on both sides by a single operation, and to important improvements in folding, stitching, and type-setting machines.

For the first few years of its existence *The Times* was edited and managed solely by the two Walters—father and son. Its outspoken criticism of the King and his Ministers during this period drew down on the proprietors the wrath of the Government, and as a result they were several times fined and imprisoned in Newgate. Several attempts were likewise made to hamper or suppress their foreign news service, but this department of the paper had been carefully and systematically developed with the result that the news of Trafalgar and Waterloo and other notable victories of the British arms were published in London before the arrival of the official dispatches.

For some time prior to 1816 *The Times* was edited by Sir John Stoddart. In the latter year the editorial control was intrusted to Thomas Barnes. He was assisted as a leader-writer by Edward Sterling, whose virile articles earned for him the name of 'The Thunderer.' For a period of thirty-six years—from 1841 to 1877—the editor was John Thaddeus Delane (q.v.), one of the greatest of English journalists. He was succeeded in turn by Thomas Chenery, upon whose death in 1884 George Earle Buckle became editor. The influence and position of *The Times* rank it as unquestionably the leading paper of the British Empire, if not of the world. It has remained independent of party and has consistently favored a strong foreign policy and a constant strengthening of the ties between the mother country and the colonies. It supported in turn Beaconsfield's stand on the Eastern question and Gladstone's Egyptian policy. When, however, the latter adopted the idea of Home Rule for Ireland, *The Times* withdrew its support, was an active factor in the promotion of the Liberal-Unionist Party, and contributed largely to the defeat of the Home Rule bills. It was in the course of this campaign that it made one of its few great blunders in the publication of the famous Pigott forgeries, known as 'The Parnell Letters.' It supported Salisbury's Ministry in its South African policy in 1899-1902, although it vigorously criticised the conduct of the war after it had begun. In addition to its daily issue *The Times* publishes a tri-weekly, known as *The Mail*, a weekly edition, and a weekly *Literary Supplement*. It has published also an *Atlas* and a *Gazetteer*, and in 1898 undertook a reprint of the *Encyclopædia Britannica*, which with the subsequently published supplementary volumes constitutes the tenth edition of that celebrated work.

TIME SIGNALS. Signals used for the accurate regulation of clocks and watches. In the United States time signals are based on astronomical observations made at the United States Naval Observatory in Washington. These observations enable the astronomers there to keep their standard clock regulated; and from this clock a daily noon signal is sent out by electric telegraph to the Western Union Telegraph Company. This company in turn uses the observatory signal to regulate its standard clock, from which accurate time is distributed telegraphically to the public. Various persons, jewelers and others, who are subscribers to the Western Union time service, receive signals electrically, and are thus able to keep their own standard clocks correct. In certain places a 'time-ball' is let fall exactly at noon by means of an automatic electric signal from the telegraph company, and the public are enabled to regulate watches and clocks. In England an analogous time-service is furnished from the Royal Observatory at Greenwich; and other European countries, such as France and Germany, have similar arrangements in successful operation. Thus the direct determination of time by actual astronomical observation has been rendered unnecessary on the part of jewelers and nautical instrument makers. These latter were formerly compelled to observe time-stars themselves with small transit instruments (q.v.), in order to regulate the chronometers of vessels about to put to sea.

TIM'OCLES (Lat., from Gk. Τιμοκλῆς, *Timoklēs*) (4th cent. B.C.). An Athenian comic poet, belonging to the Middle Comedy. He was noted for his pure and pungent style and for his attacks on Demosthenes. The fragments of his plays are best published in Kock, *Comicorum Atticorum Fragmenta*, vol. ii. (Leipzig, 1886).

TIMO'CREON (Lat., from Gk. Τιμοκρέων, *Timokreōn*). A Greek lyric poet of the early fifth century B.C., born at Ialysus, in Rhodes. His works are lost, but his name has survived through his hatred for Themistocles, whom he bitterly attacked. The statesman was defended, however, by his friend Simonides, whose sarcastic epigram on Timocreon's gluttony and bibulous habits has been preserved by Athenæus. Tradition says that Timocreon excelled in drinking songs, to which he gave a satiric tone. Fragments are in Bergk, *Poetæ Lyrici Græci*, vol. iii., 4th ed. (1887).

TIMO'LEON (Lat., from Gk. Τιμολέων, *Timoleōn*) (?-B.C. 337). A Greek general, and the liberator of Sicily from the dominion of the tyrant Dionysius the Younger. He was born at Corinth, perhaps about B.C. 394, and was a member of one of the noblest and most illustrious of Corinthian families. On one occasion in battle he saved his brother Timophanes's life at the risk of his own, but, when Timophanes attempted to overthrow the democratic form of government at Corinth and make himself sole tyrant, Timoleon brought about his brother's death and the reëstablishment of the old constitution. Just after this event, and while the Corinthians were still deliberating with regard to the act, in B.C. 344, an embassy arrived at Corinth from Syracuse in Sicily, a colony of Corinth, requesting the aid of the Corinthians in the civil dissensions which were taking place in the island. A force was sent to assist the Syracusans, with Timoleon at the head. In Sicily at this time Hicetas and Dionysius the Younger were both striving to obtain the supremacy in Syracuse. The force commanded by Timoleon was small, but he succeeded in a short time in driving both of the would-be tyrants from the city. After repeopling the almost desolate city by recalling the exiles, and inviting new colonists from Greece, Italy, and Sicily, he spent the next two years in enacting laws and organizing a constitution, which he put on a completely democratic footing. The Carthaginians, alarmed at the reviving power of Syracuse, and the prospect of union among the Sicilian Greeks, now sent an army of 80,000 men under Hasdrubal and Hamilcar to subdue the whole island. Timoleon, with only 12,000 men, encountered them (B.C. 339) on the Crimissus, and gained one of the greatest victories ever won by Greeks over barbarians. He now proceeded to free the other Greek cities from the rule of the tyrants, and made a treaty with the Carthaginians, whereby the Halycus River was fixed as the boundary between the Greek and Carthaginian dominions in Sicily. Hicetas was driven from Leontini, and Mamercus from Catena, and free constitutions were conferred upon all the Greek cities in Sicily. After his great work was accomplished Timoleon lived as a private citizen at Syracuse, respected and honored, until his death. He died in B.C. 337, having been blind for a considerable time previously, and was buried in the market-place of Syracuse, where a gymnasium, called the Timoleonteum, was afterwards erected over his tomb. Consult Plutarch's *Life of Timoleon*, the standard histories of Greece, and Freeman's *History of Sicily* (1891-94).

TI′MON (Lat., from Gk. Τίμων). Called The Misanthrope. A native of Athens, who lived at the time of the Peloponnesian War. The little that is known concerning him is learned chiefly from Aristophanes and the other comic poets of the period, and from Lucian, who made him the subject of one of his best-known dialogues. Disgusted with mankind, on account of the ingratitude of his early friends and companions, he lived a life of almost total seclusion from society, the only visitor whom he would receive being Alcibiades. Numerous stories were current in antiquity regarding his eccentricities, one of which is that he died because he would not allow a surgeon to visit him to set a limb. His grave, which was on the seashore, is said to have been planted with thorns, and to have been rendered inaccessible by the sea, which formed it into a small island. Shakespeare's *Timon of Athens* has as its ultimate source Lucian's dialogue.

TIMON OF ATHENS. A tragedy produced in 1607 or 1608, printed in 1623, of which Shakespeare wrote only the chief scenes, and which another, possibly Wilkins, finished; or perhaps Shakespeare's remodeling of an old play. The sources are the story of Timon told in the Life of Antony in North's *Plutarch* and in Painter's *Palace of Pleasure,* and used by Boiardo in his comedy *Il Timone.*

TIMON OF PHLI′US. A Greek poet and skeptic, who lived at Athens about B.C. 275. He wrote numerous works in both prose and verse. The most celebrated of his poems were the three books of *σίλλοι*, in which, in the form of a parody of Homer's epic poetry, he ridicules the tenets of all dogmatic philosophers, living or dead, from the skeptic's point of view. Like the classic satire of Rome, they were written in hexameter verse and, according to the testimony of the ancients (Diog. Laërt. ix. 12, 109-115; Euseb. Praep. Ev. xiv. p. 761), were excellent productions of their kind. The fragments are published in Wölke, *De Græcorum Syllis* (Warsaw, 1820); Paul, *Dissertatio de Sillis* (Berlin, 1821); and Wachsmuth, *De Timone Phliasio Ceterisque Sillographis Græcis* (Leipzig, 1885).

TIMOR, tê-mōr′. The largest and most southeastern of the Lesser Sunda Islands, situated 330 miles southeast of Celebes and 700 miles east of Java, between which and Timor the main chain of Lesser Sunda Islands intervenes (Map: Australasia, E 3). It has an extreme length from northeast to southwest of about 280 miles, with an average breadth of 55 miles, and an area estimated at 12,395 square miles. The coasts are for the most part steep, lined with coral reefs, and difficult of approach. The interior is not well known. It is traversed by a forest-covered mountain range, and the geological formation seems to be a core of slate, diorite, and serpentine flanked by beds of carboniferous limestone, Triassic sandstone, and some Tertiary formations. The mineral wealth is considerable, but unexploited. The climate is hot and unhealthful on the coast, and the rainfall is very slight, especially in the south. The flora and fauna are less varied than in the other East Indian islands, and the island forms a transition region between these and Australia. The resources of the island are not developed; agriculture is primitive, and the exports are few and small in quantity, coffee, wax, and a little sandalwood being the chief staples. Politically the island is divided nearly equally between Holland and Portugal, the latter possessing the northeastern half, with the seat of government at the small town of Deli. The Dutch portion forms the principal member of the Residency of Timor, which includes also the islands of Rotti, Savu, and Sumba, Eastern Flores, and the Solar and Allor groups. The capital of the residency is Kupang, a town of about 7000 inhabitants at the southern extremity of the island. The inhabitants are mainly Papuans with some intermixture of Malays and Chinese. Their number is vaguely estimated at 400,000. The number of Europeans in the entire Dutch residency was only 256 in 1895. Consult: Bastian, *Indonesien* (Berlin, 1885); Forbes, *A Naturalist's Wanderings in the Eastern Archipelago* (London, 1885); Wichmann, *Sammlungen des Geologischen Reichmuseum* (Leyden, 1881-84).

TIMORLAUT, tê-mōr′lout, or Tenimber. A group of islands in the East Indian Archipelago, belonging to the Dutch Presidency of Amboyna, and situated between the Banda and Arafura seas, 240 miles southeast of the island of Ceram in the Moluccas, and about midway between New Guinea and the Lesser Sunda Islands (Map: Australasia, F 3). It consists of the large islands of Yamdena (1132 square miles), Larat, and Selaru, and a number of smaller islands, with a total area of about 2060 square miles. The large islands are hilly and forested, rising to a height of about 1000 feet, while the others are low and flat, and of coral formation. The inhabitants, a mixture of Malays and Negritos, are engaged in primitive agriculture, cattle-raising, and trepang fishery. Population, in 1895, officially estimated at 24,858.

TIMOTE, tė-mō̆′tȧ. A group of small tribes apparently constituting a distinct linguistic stock, whose modern representatives still occupy the mountainous district of Mérida, southward from Lake Maracaibo, in Western Venezuela. In former times they usually went naked, with their bodies painted red, and were agricultural, cultivating corn, chile, and various edible roots. They buried their dead in caves or in underground vaults, depositing with the corpse sacred figurines of clay.

TIMOTHEUS, tĭ-mŏ′thė-ŭs (Lat., from Gk. Τιμόθεος,), OF MILETUS. A Greek poet and musician, son of Thersander; he lived about B.C. 450-357. He was first of all a citharodes, i.e. one who, while singing, played his own accompaniment on the cithara. The special form of lyric poetry used for these public performances was the *Nomos*, whose name Terpander was said to have established. Originally this was largely a musical performance of hexameters from the epic, but Timotheus seems to have given definite form to novelties already attempted, and greatly enlarged the possibilities of artistic display by introducing a free metrical structure, which offered full scope for elaborate musical composition and vocal execution. He further enlarged his opportunities by increasing the number of strings on the cithara to eleven. His innovations met with strong opposition, and were especially distasteful to the Spartans, against whom he defends himself in his "Persians." His works have till recently been known only through the scantiest fragments and allusions, but in 1902 a papyrus manuscript of his nomos, the "Persians," was discovered by the German Oriental Society in a Greek sarcophagus at Abusir, near Memphis, in Egypt. About 116 lines of considerable length are preserved, and 80 of these are practically complete. It is the oldest Greek manuscript yet found, and was copied but a few years after the death of the author, and the fact that it is the only specimen of this branch of the Greek lyric lends special value to the poem. The subject is the defeat of the Persians at Salamis, and it seems to belong to the early years of the fourth century, when Athens was humbled and Sparta supreme, for in the vivid description of the battle there is no mention of Athens. The dialect, however, is the Attic of the poets. The style is highly wrought with many compounds and metaphorical terms, often farfetched. Timotheus seems to have been less a poet than a musician, and with only his libretto it is scarcely possible to estimate properly his real position in Greek literary art. Consult: Wilamowitz-Möllendorf, *Timotheos, Die Perser* (Leipzig, 1903), text, a Greek paraphrase, and explanatory essay; *Der Timotheos Papyrus* (ib., 1903), photographic facsimile; T. R. in *Revue des études grecques*, vol. xvi. (Paris, 1903), an essay and translation into French.

TIM′OTHY (Gk. Τιμόθεος, *Timotheos*). One of the trusted disciples and assistants of the Apostle Paul. He was a native of Lystra, in Lycaonia, the son of a Gentile father and a Jewish mother (Acts xvi. 1). As a child he was carefully instructed in the Old Testament Scripture (II. Tim. iii. 15), but he was not circumcised. It is likely that his mother, Eunice, and his grandmother, Lois, were among the first converts made by Paul and Barnabas on their first visit to Lycaonia, and soon after, either through their or Paul's own agency, the youth Timothy embraced the new faith (II. Tim. i. 5). When Paul revisited Lystra Timothy was already favorably known in the neighborhood as an active Christian (Acts xvi. 2). Paul persuaded him to go with him as an assistant. Probably at the same time he was ordained by the local presbytery in accord with certain prophetic intimations as to his future (I. Tim. i. 18; iv. 14). To avoid unnecessary offense to the Jews, he was circumcised. From this time until the close of Paul's life Timothy was one of his most faithful, trusted, and intimate disciples. He was intrusted several times with important missions to the churches founded by the Apostle. At Berea (Acts xvii. 14), Athens, and Thessalonica (I. Thess. iii. 1-6), at Corinth, and later at Ephesus (I. Cor. iv. 17, xvi. 10), and again in Macedonia (Acts xix. 21-22) he rendered important services, and is joined with himself by Paul in the addresses of several of his epistles. Though he went to Jerusalem with Paul (Acts xx. 4), he was probably engaged in labors elsewhere when the Apostle embarked on his voyage to Rome. He visited his master at Rome (see the opening words of Philippians, Colossians, and Philemon), and was probably sent by Paul, shortly before his release, with a message to Philippi (Phil. ii. 19). After the Apostle's release he rejoined Timothy in the East, and later left him in charge at Ephesus in a position full of great responsibility. In his anxiety Paul wrote him the letter of advice and warning known as I. Timothy. When Paul was imprisoned the second time, and probably not long before his death, he wrote II. Timothy, summoning his beloved disciple to come to him as quickly as possible. At some later date Timothy himself was arrested, but afterwards released (Heb. xiii. 23). According to tradition he passed the remainder of his days as Bishop of Ephesus.

TIMOTHY and TITUS, EPISTLES TO. Three letters of the New Testament commonly known as the Pastoral Epistles, bearing in their opening passages the claim to have been written by Paul.

The first two are addressed to Timothy, Paul's companion and fellow worker, whom the Apostle associated with himself at Lystra, on his second missionary tour (Acts xvi. 1-3), and who continued with him practically through the remainder of his active ministry. He was with Paul also in Rome, where he is named with the Apostle in the Epistles to the Colossians, Philippians, and Philemon. The last letter is addressed to Titus, also one of Paul's helpers, first met with in connection with the mission work in Antioch (Gal. ii. 1-4; cf. Acts xv. 22), and probably more or less associated with the Apostle's later work, though he is not mentioned again until the correspondence with the Corinthian church. All three letters have to do with the Apostle's instructions regarding the pastoral service in which the recipients were engaged at the time of writing. The second letter to Timothy, however, contains in addition a different element of a more personal kind.

For almost a century these letters have been the subject of critical suspicion in respect of their authorship, being discredited by liberal criticism long before the Tübingen School assigned them to the Gnostic period of the second century, and standing to-day as among the most generally rejected portions of the New Testament. At the same time, there has been from the first more or less disposition on the part of such criticism to recognize in the letters certain traces of genuine Pauline material—this tendency receiving of late large impulse from the propaganda of the Dutch School, which seeks to resolve all New Testament critical problems by aid of documentary sources for the writings in question. Along with this the date at which the letters in their present form were composed has been gradually moved back toward and even into the Apostolic century. The present differences in the liberal attitude toward the Epistles are practically as to the extent of Pauline material allowed in the Epistles and the nearness in thought and sympathy with the Apostle of their compiler. On the other hand, while this general negative position has been strongly combated by a conservative criticism which has sought to defend the entire genuineness of the letters, there is to-day a tendency to admit frankly the peculiar difficulties presented by the writings in the matter of their Pauline origin and a willingness to unite with all scholars in a fair and impartial study of the problems which these difficulties involve.

The question as to the Paulinity of these letters is naturally bound up in the larger question of the Apostle's second imprisonment, since it is clear that the letters disclose situations which in no way fit into the recorded life of Paul up to and including his first imprisonment. If, therefore, the Apostle was not released from the imprisonment narrated in Acts, engaging in further mission work, which ended in his being rearrested and brought to Rome for a second trial, these writings cannot reasonably be supposed to have come from his hand.

But the settlement of the question of authorship on the basis of this question of imprisonment alone has proved an unsatisfactory procedure, as in itself a second imprisonment is not possible of sufficiently definite decision to afford a critical standing ground. Scholars consequently have been giving of late increased attention to the study of the Epistles themselves —their vocabulary and literary style, the historical situations which they present, the ecclesiastical and theological development which they betray—in order to discover whether or not they involve sufficient Pauline elements to presuppose, on the Apostle's part, a further period of active ministry beyond the imprisonment narrated in Acts. The critical relation of the second imprisonment to the authorship of the letters is thus reversed, the latter rather than the former problem furnishing the standing ground from which the investigation proceeds.

In this investigation the questions which furnish the chief debate are (1) the specific stage of church organization and (2) the particular phase of false teaching which the letters disclose.

(1) As to the organization presented, it is clear that Timothy and Titus are representatives of the Apostle in charge over certain fields of work (I. Tim. i. 3, 4; iv. 11-16; II. Tim. ii. 1, 2; iv. 1, 2; Tit. i. 5, 6; ii. 15; iii. 12-14), which fields are evidently general, covering more or less extended regions around specific localities (I. Tim. ii. 8; Tit. i. 5), while the charges are apparently temporary (I. Tim. i. 3, 4; Tit. i. 5; iii. 12). The instructions given to the church officers referred to in the letters have to do with the distinctive moral qualities of the candidates, rather than with the functions of their office (I. Tim. iii. 1-13; v. 4-16; Tit. i. 5-9); while the offices themselves are presbyterial rather than monarchical (I. Tim. iii. 1-7; v. 17-19; Tit. i. 5-9). In fact, the church teaching accomplished among the people, though connected with the elder's office (I. Tim. iii. 2; v. 17; II. Tim. ii. 2-4; Tit. i. 9) is not confined to official hands, but is extended to individual members within the congregation who carry it on from house to house. It is this that the false teachers abuse (I. Tim. i. 3-7; vi. 3-5; II. Tim. iii. 6-9; Tit. i. 10-14). Clearly this organization is not what we find in the recorded New Testament history.

(2) As to these false teachers, they are evidently of two classes: (A) a class then at work among the people (I. Tim. i. 5-11; vi. 3-10; II. Tim. ii. 14, 16-18, 24-26; iii. 8, 9; Tit. i. 10-16) and (B) a class definitely predicted as to develop among them in later times (I. Tim. iv. 1-3; II. Tim. iii. 1-7; vi. 3, 4). (A) The present class is evidently further divided into two groups: (1) The main portion, working among the congregation, as members themselves of the churches (I. Tim. vi. 20, 21; II. Tim. ii. 17, 18; iii. 6-9; Tit. i. 10-16). (2) The smaller portion separated from all church membership (I. Tim. i. 19, 20; v. 11-15; Tit. iii. 10). (1) This first and larger group is described in the letters (a) as only nominally Christian (I. Tim. i. 4, 19; II. Tim. ii. 14-18; Tit. i. 9, 13, 16); (b) as having their chief occupation in teaching among the people of the parishes—going from house to house with their doctrines and making their teaching a business of money gain (I. Tim. vi. 3-10; Tit. i. 11); (c) as busying themselves in this teaching with affairs which ministered only to wordy disputes (I. Tim. i. 4; vi. 4; Tit. iii. 9), and within these disputes as having specifically to do with Jewish questions such as the contents and authority of the Mosaic law (I. Tim. i. 7; Tit. iii. 9), Jewish legends and genealogies (I. Tim. i. 4; Tit. i. 14; iii. 9). (d) At the same time it is evident that they are not identical with the Judaizers pictured to us in the Galatian and Corinthian Epistles. They are developed beyond them, especially in their indifference to the moral claims of the Christian life (I. Tim. i. 10; vi. 3-10; Tit. i. 15-16). On the other hand, they are not advanced to the full matured Gnostic doctrine of God. Formally they hold to the doctrine of God and grace, though practically denying them in life (II. Tim. iii. 5; Tit. i. 16). (2) The second and smaller group is more definitely referred to in the letter to Titus, but in the Timothy Epistles some appear to have been excommunicated on moral grounds (I. Tim. i. 19, 20), while certain younger women, who had rejected their first faith, seemed to have 'turned aside to Satan' (I. Tim. v. 11-16). (B) The future errorists arrange themselves in three groups: (1) The first is described in I. Tim. iv. 1-3 as carrying on an extreme form of

teaching and developing a hardness of character. (2) The second is described in II. Tim. iii. 1-5 as wholly demoralized in character and yet as nominally within the Church. (3) The third is described in II. Tim. iv. 3, 4 as not enduring wholesome teaching and consequently as turning definitely away from the truth to legends. Evidently these teachers, whether present or future within the Church or separated from it, are no reproductions of the errorists described in any of the accepted New Testament writings.

Inasmuch, however, as the instructions to Timothy and Titus are gathered largely around these two points of organization and false teaching, it is evident that should the development of the errors of the Church life show itself to be beyond what was possible in the Apostolic age, these letters which portray them—or at least those portions of the letters which contain their description—must themselves come under strong suspicion of being by a later hand than Paul's. At the same time it is generally recognized that, in proportion as the Church organization is seen to involve on the part of Timothy and Titus a representative and not an independent position, exercised over a large region of country, necessitating a more or less itinerant mission work, and this only for a temporary and not a permanent period, it shows an early rather than a later stage of Church life, which is confirmed by the fact that this organization involves in the instruction given to the officers qualifications in the line of moral rather than functional requirements and in the offices themselves the undeveloped presbyterial rather than the developed monarchical form, while the teaching function is carried on in this parish fashion rather than in any strictly official way. Further, in proportion as the teaching shows an unmatured and unschismatic form and is characterized by elements which are distinctively Jewish, it does not belong to the later full-fledged system of the Gnostics. The period of Church life and thought which these Epistles portray may be thus not only within the Apostolic age, but even within the period of Paul's possible lifetime, in spite of the fact that it lies beyond what is specifically disclosed to us in the New Testament writings.

Just how early this period may be, and whether or not it is within Paul's life, is the present problem before the critical investigation of these documents. It is clear, however, that should the results reached by a fair-minded study of the problem favor a possible origin from Paul, these writings would themselves stand as records of a later period of activity on the Apostle's part than that narrated in the Book of Acts and his acknowledged Epistles, and thus be indicative of a release from his first imprisonment and of a second imprisonment at Rome. In any case it is apparent that the bearing of the external evidence for or against a second imprisonment, as well as in favor of or opposed to the genuineness of the Epistles themselves, must be in the direction of a positive or negative support of the results obtained rather than in the direction of determining the results to be obtained.

BIBLIOGRAPHY. *Commentaries:* Soden, in *Hand-Commentar zum Neuen Testament* (Freiburg, 1891); Liddon, *Explanatory Analysis of First Timothy* (London, 1897); Stellhorn (Gütersloh, 1899); Weiss, in *Meyer-Kommentar über das Neue Testament* (Göttingen, 1902). *Introductions:* Weiss (Eng. trans., Edinburgh, 1888), Holtzmann (Freiburg, 1892), Godet (Eng. trans., Edinburgh, 1894), Salmon (London, 1894), Zahn (Leipzig, 1900), Bacon (New York, 1900), Moffatt, *The Historical New Testament* (ib. 1901), Jülicher (Leipzig, 1901). *Discussions:* Bauer, *Die sogenannten Pastoralbriefe des Apostels Paulus* (Stuttgart, 1835); Holtzmann, *Die Pastoralbriefe* (Leipzig, 1880); Lightfoot, in *Biblical Essays* (London, 1893); Clemen, *Die Einheitlichkeit der Paulinischen Briefe* (Göttingen, 1894); McGiffert, *The History of Christianity in the Apostolic Age* (New York, 1896); Harnack, *Geschichte der altchristlichen Litteratur* (Leipzig, 1897); Steinmetz, *Die zweite römische Gefangenschaft des Apostels Paulus* (ib., 1897); Hort, *The Christian Ecclesia* (London, 1898); Falconer, *From Apostle to Priest* (Edinburgh, 1900); Frey, *Die zweite römische Gefangenschaft und das Todesjahr des Apostels Paulus* (Leipzig, 1900); Bowen, *The Dates of the Pastoral Letters* (London, 1900); Harnack, *Die Ausbreitung des Christentums* (Eng. trans., London, 1903); Dobschütz, *Die urchristlichen Gemeinden* (Eng. trans., ib., 1903); Wernle, *Die Anfänge unserer Religion* (Eng. trans., ib., 1903); Spitta, *Zur Geschichte und Litteratur des Urchristentums* (Göttingen, 1893-1901).

TIMOTHY GRASS (so called from *Timothy* Hanson, who introduced the seed into the Carolinas about 1720), *Phleum pratense.* The only grass of its genus that is valued for hay and pasturage. It is the herd's grass of New England and New York, and along with the other species of the genus, is in England often called cat's-tail grass. It is distinguished by a long cylindrical panicle so compact as to resemble a close spike, strong culms, attaining a height of 4 to 5 feet, but tender and nutritious, and much relished by cattle. It is perennial, but springs up rapidly, even in the year in which it is sown. The seed is very small. It varies in size according to soil and situation. In the United States timothy hay is considered one of the most valuable hays made wholly from grass and is commonly used as the standard with which to compare other hays. (For its feeding value, see GRASSES; HAY.) Timothy may be sown alone, or, as is more commonly the practice, in a mixture with clover, generally with red clover. It succeeds best on moist, rich soils. Upon dry soils it is often bulbous at base, and this form, which is due to the conditions of growth, was once described as a distinct species (*Phleum nodosum*). See Plate of GRASSES.

TIMPERLEY, CHARLES H. (1794-c.1846). An English printer and author, born in Manchester, and educated at the free grammar school there. He served in the Napoleonic wars and was wounded at Waterloo. Returning to England, he worked under an engraver and copper-plate printer, and in 1821 he became a letter-press printer. Late in life he settled in London, where he died. His valuable publications connected with printing comprise *The Printer's Manual* (1838); *A Dictionary of Printers and Printing* (1839); and *Songs of the Press*, original and selected, the best collection of printers' songs in English (1845). The first two books were issued in 1842 as an *Encyclopædia of Literary and Typographical Anecdotes.* Timperley also published *Annals of Manchester* (1839).

TIM′ROD, Henry (1829-67). An American poet, born in Charleston, S. C. He was educated at the University of Georgia and studied law with the well-known jurist James Louis Petigru, but finally trained himself for the position of a private tutor in families, which gave him more leisure for developing his poetical talents. During the years immediately preceding the Civil War he formed one of the coterie presided over by William Gilmore Simms (q.v.), and contributed poems to *Russell's Magazine* and the *Southern Literary Messenger.* In 1859 he published a volume of poems which was favorably noticed. He served as war correspondent of the Charleston *Mercury* and in 1864 removed to Columbia, S. C. His later years were passed in poverty and physical pain. His friend Paul H. Hayne superintended an edition of his poems (1873), which was well received by competent judges. In 1899 a memorial edition of his works was undertaken. His fame as the best of Southern lyrists, after Poe, and probably Sidney Lanier, is now well established. Among his best poems are "Katie," "The Cotton Boll," "Charleston," and an admirable ode on the Confederate dead buried in Magnolia Cemetery, Charleston.

TIMSAH, tĭm′sä, Lake. A lake traversed by the Suez Canal (q.v.).

TIMUCUA, tē-mōō′kwȧ, or Timuquanan (ruler, master). A group of tribes, constituting a distinct linguistic stock, which formerly occupied central and northern Florida from about Tampa Bay and Cape Canaveral northward to Saint Mary's River. Their southern limit is unknown. When first known to the Spaniards they had from twenty to forty settlements, principally along the lower Saint John's River. Narvaez (1527) and De Soto (1539) both passed through their territory, meeting determined resistance in each case. The Huguenots, under Laudonnière, landing on the east coast in 1564, met with a friendly reception, the friendship continuing during the brief existence of the French colony. At this time there seem to have been at least five cognate tribes speaking as many dialects. On the expulsion of the French the Timucua tribes came under the dominion of the Spaniards, by whom they were compelled to work in large numbers upon the fortifications of Saint Augustine. In 1687, already greatly diminished, they made an unsuccessful attempt to revolt. In 1702-06 successive inroads of the English of Carolina, with their hundreds of Indian allies, wiped out the mission villages of the Timucua, who fled to the upper waters of the Saint John's, where Tomoco River in the present Volusia County preserves their name. The abandoned territory was afterward occupied by the Seminole (q.v.). Consult Pareja, *Arte de la lengua timuquana* (new ed. by Adam and Vinson, Paris, 1886).

TIMUR, tē-mōōr′, Timur-beg, Tamerlane, or Timur-leng (Timur the Lame) (1336-1405). A Mongol conqueror, born at Kesh or Sebz, 40 miles from Samarkand. At this time the real power over Turkestan was in the hands of independent chiefs of Mongol blood, each of whom chose a prominent city of the kingdom, and thence ruled the surrounding country. One of these chiefs, Haji Berlas, the uncle of Timur, had established himself at Kesh, and here the future conqueror passed the first twenty-four years of his life. In 1360 the Kalmucks of Jettah, led by Tughlak Timur, subjugated Turkestan. Declining to accompany his uncle in his flight, Timur met Tughlak, who made him governor of Kesh, and appointed him one of the principal ministers of his son, the new monarch of Turkestan. The Kalmucks were ultimately expelled in 1365, and Turkestan was divided between its two liberators, Hussain and Timur. In 1369 war broke out between them, Hussain was defeated and slain, and Timur became lord of Turkestan. He did not, however, assume the rank of a sovereign, but, elevating one of the royal race to the throne, reserved for himself the real authority and the title of Emir. He then proceeded to take vengeance on the Kalmucks and turned westward to punish the predatory tribes of Khwaresm, who had plundered Bokhara. He spent the interval between these campaigns in supporting Toktemesh Khan, one of the claimants to the throne of Kiptchak, whom he placed in 1376 in undisputed possession. In 1383 the people of Herat, whom he had subdued a short time before, rebelled and murdered his envoys. In punishment for this 2000 of the garrison, built up with alternate layers of brick and mortar into the form of a pyramid, were left by Timur as a reminder of the consequences of rebellion. Seistan was next reduced, and the Afghans of the Suleiman Koh were conquered. In the following year he invaded Mazanderan, and by the close of 1387 the whole of the country east of the Tigris, from Tiflis to Shiraz, was subdued. Those chiefs who voluntarily submitted were mostly confirmed in their governments, but the inhabitants of Ispahan, who, after a pretended submission, suddenly rose against the Tatar garrison and massacred 3000 of them, were almost completely exterminated.

Meanwhile, Toktemesh Khan invaded Timur's territories on the Amu. Timur brought him to bay on the banks of the Bielaya (a tributary of the Kama), June 18, 1391, where he almost annihilated his forces. In 1392 Timur crossed the Tigris, subdued the numerous and warlike principalities to the east of the Euphrates, then advanced northward, through the gates of Derbend, to the Volga, in 1395 again routed Toktemesh on the banks of the Terek, and then turned west as far as the Dnieper, and then north to Moscow, returning by Astrakhan and the Caucasus, leaving death and desolation in his track. In 1398 Timur entered India by the passes of the Hindu Kush, near Kabul, and routed the armies which opposed him, till the number of prisoners became so great that four days before the great battle at Delhi he ordered the murder, in cold blood, of all the males (said to be 100,000 in number), and then took the capital. After advancing to the Ganges, Timur returned to Samarkand, where he expended the spoils of the expedition in the adornment of his city. In the following year he attacked the Egyptian Empire in Syria. He was as usual completely successful. Timur's aid was then invoked by the Emperor of the East and several princes of Asia Minor to help them defeat the Turks led by Bajazet I. (q.v.). The two hosts met at Angora on July 20, 1402, and after a long and obstinate contest the Turks were totally routed and Bajazet captured. The conquest of the whole of Asia Minor speedily followed. The Byzantine Emperor did homage to the victor, as did also the Turkish ruler of Thrace, and the Knights of Saint John were expelled from Smyrna. On his return Timur conquered Georgia, where he passed the winter, and, resuming his march in the following year by way of Merv and Balkh, he reached Samarkand in 1404. Here he resumed preparations for his long projected invasion of China, and was marching along the Sihun when he was attacked by ague, and died after a week's illness, February 17, 1405.

Timur did much to promote the arts and sciences throughout his dominions, and, despite his cruelty in war, was an able, politic, and kindly ruler in time of peace, although the speedy dissolution of his empire deprived his labors of any permanent utility. Two works are attributed to him, entitled *Malfūzāt*, or Annals, translated by Stewart (London, 1830), and *Tukūzāt*, or Ordinances, translated by Davy-White (Oxford, 1783) and Langlès (Paris, 1787). Their authenticity is neither proved nor disproved. In literature Timur is best known through Marlowe's (q.v.) drama *Tamburlaine the Great*. Consult: Sharaf ud-din Ali Yazdi, *Zafarnāmah*, translated by Petis de la Croix, *Histoire de Timur-Bec, connu sur le nom du grand Tamerlan* (Paris, 1722); Manger, *Vita Timuri*, a translation of the Arabic biography by Ibn Arabshah (Leovardae, 1767-72); Horn, "Geschichte Irans in islamitischer Zeit," in Geiger and Kuhn, *Grundriss der iranischen Philologie*, vol. ii. (Strassburg, 1900).

TIN (AS. *tin*, OHG. *zin*, Ger. *Zinn*, tin; connected with Goth. *tains*, AS. *tān*, OHG. *zein*, twig, thin leaf of metal). A metallic element known since ancient times. Implements formed of an alloy of tin and copper have been found among ancient Assyrian remains, and the tin employed in the manufacture of such bronze was obtained by the Phœnicians from the islands called Cassiterides, somewhere off the west coast of Europe. It is known definitely that after the conquest of Britain by the Romans tin was carried from the Cornish mines through Gaul, by way of Marseilles, to Italy. Pliny distinguished tin as *plumbum album* or *candidum* from *plumbum nigrum* (lead), and about the fourth century the name of *stannum* was given to tin. The alchemists called it *jupiter*, and sometimes *diabolus metallorum*, owing to its property of forming brittle alloys. Native tin is said to have been found in small crystalline grains with corundum, gold, and platinum in superficial deposits in New South Wales, and it has been reported elsewhere, but it is extremely doubtful whether the metal occurs native. The principal ore is the dioxide, *cassiterite*, sometimes called 'tinstone;' tin is also found as the sulphide, with copper and zinc, the mineral being known as *stannite* or *tin pyrites*. Smaller quantities of tin are also contained in certain other minerals.

Tin (symbol, Sn, *stannum;* atomic weight, 119.05) is a silver-white, lustrous metal that has a specific gravity of about 7.3, and melts at 235° C. (455° F.). It can be easily rolled or hammered out to thin foil, and at 100° C. (212° F.) may be drawn into wire, which, however, possesses but little tenacity. Tin has a fibrous structure, and when bent emits a peculiar crackling sound, caused by the friction of the crystalline particles. It finds extensive use in the manufacture of tin plate (see below), in the preparation of vessels for household and technical purposes, for the manufacture of tin-foil, for tinning copper and iron, and in the manufacture of alloys, including amalgam for silvering mirrors, bell metal, bronze, gun metal, pewter, type metal, etc. It combines with oxygen to form two oxides, of which the stannous oxide, or monoxide, is an olive brown powder that is obtained when stannous oxalate is heated out of contact with air, and combines with basic radicles to form *stannates*, of which the sodium stannate is used in calico dyeing and printing. The stannic oxide, or dioxide, which is found native as cassiterite, is obtained as a white powder when tin is heated until it burns in the air. It finds some use, under the name of 'putty powder,' for polishing plate glass, and also for imparting a white color to glass and enamels. *Stannous chloride*, $SnCl_2$, and *stannic chloride*, $SnCl_4$, are both used as mordants in dyeing and calico printing under the name of 'tin salts' or 'tin crystals,' and are readily prepared by dissolving the metal in hydrochloric acid. Stannic sulphide, which is prepared by heating tin with mercury, sulphur, and ammonium chloride, is known commercially as 'mosaic gold,' and was formerly used for gilding, imitating bronze, etc. The beautiful purple-colored precipitate obtained by the reaction of gold chloride on stannous salts has been described under CASSIUS, PURPLE OF (q.v.).

OCCURRENCE AND PRODUCTION. Tin ore or cassiterite has been found in many localities in different parts of the world, but its occurrence from a commercial standpoint is quite limited. Its sources are veins in the older rocks, particularly a variety of granite called greisen, and alluvial deposits, the latter being formed by the erosion of rocks carrying the veins. The ores obtained from veins are commonly known as lode-tin, while those found in stream deposits are known variously as black tin, tin sand, stream tin, and *barilla*. The principal supplies of ore are obtained from the East Indies, in the islands of Banca, Billiton, and Sumatra, the Malay Peninsula, Australia, Bolivia, and Cornwall, England. Most of the ore from the East Indies and Malay Peninsula is obtained by washing alluvial gravels. There are also mines in Saxony, Bohemia, Russia, Spain, Portugal, and Japan, but the aggregate output of these countries is insignificant. The occurrence of tin in California, Texas, South Dakota, and North Carolina has been known for a long time, but so far it has not been mined anywhere on a commercial scale. A discovery of ore in the York district of Alaska has been the cause of active exploration in that region, and there is some prospect that it may lead to the successful inauguration of tin-mining within the territory of the United States.

The world's production of tin in 1901 as reported by *The Mineral Industry* was as follows:

	Metric tons
Austria	49
Banca and Billiton	19,365
Bolivia	14,932

	Metric tons
England	4,634
Germany	1,451
New South Wales	677
Singkep	793
Straits Settlements	51,339
Tasmania	1,818
Total	95,058

Metallurgy. The only ore of tin which is used for the extraction of the metal is tinstone or cassiterite. The extraction of tin is usually performed by dry methods—that is, by a process of calcining and reduction in furnaces, but wet methods and electro-metallurgical methods are also employed to some extent. The ore when mined from veins has to be stamped to a very fine powder before the valuable portion can be effectually separated. This separation is performed by an elaborate series of washings whose effect is to remove the lighter impurities and to leave the heavy particles of tin where they can be collected. Various forms of washing apparatus are employed (see Ore Dressing), but the most common appliance is the puddle. In this device the ore and earthy matters, in the state of a thick mud, are conveyed by square pipes or channels to the circumference of a conical table on which, by the aid of water, the metallic portion separates, the lighter stony impurities flowing down toward the centre, and being carried away. There are also brushes for agitating the ore during the operation.

The tin ore thus far purified has next to be deprived of its sulphur and arsenic if these substances should be present; this is done in a reverberatory furnace, the flues of which are connected with large condensing chambers, in which the arsenic is deposited in a crystalline form. The sulphur which is present in the state of sulphide of iron is decomposed by the heat into sulphurous acid gas, and the remaining oxide of iron is removed by a subsequent washing. Sulphide of copper, when present, is converted by roasting, and afterwards exposing it to the air, into sulphate of copper, and is then easily dissolved out by lixiviation.

After this final washing the ore is ready for smelting in a reverberatory furnace. The charge consists of from 20 to 25 cwts. of ore mixed with one-sixth of its weight of powdered anthracite or charcoal, and a small quantity of lime or fluor-spar, to serve as a flux for the siliceous impurities. Before being put into the furnace, the mixture is moistened with water, to prevent the finely powdered ore being carried away by the draught. When the charge is placed on the hearth of the furnace, the doors are closed, and the heat gradually raised for about six hours; the oxide is then reduced by the carbon of the coal. At this stage the furnace door is opened, and the mass worked with a paddle, to separate the slag, which is raked off, and the richer portion of it melted over again. The reduced tin subsides to the bottom, and is run off into a cast-iron pan, from which it is ladled into molds, to produce blocks or ingots of a convenient size.

The tin has still to be purified, first by a process of *liquation*, and afterwards by that of *boiling*. 'Liquation' consists in moderately heating the blocks in a reverberatory furnace till the tin, owing to its comparatively easy fusibility, melts and flows into the refining basin, leaving on the hearth of the furnace a residuary alloy of tin with iron and other metals. More blocks are added and heated in the same way, till the refining basin contains about five tons. The tin is then ready for 'boiling.' In this operation billets of green wood are plunged into the melted metal, the disengagement of gas from which produces a constant ebullition, and so causes a scum (chiefly oxide of tin) to rise to the surface, which is then easily removed; at the same time, impure and dense parts fall to the bottom. When the agitation has gone on long enough, the bath is allowed to settle and cool. The tin then separates into zones—the upper consisting of the purest portion, the middle being slightly mixed with other metals, and the lower so much so that it requires to go through the refining process again. The residuary alloy of the liquation process has also its tin extracted and refined again.

In former times in Cornwall tin was smelted in a blast furnace (see Iron and Steel) instead of a reverberatory one; and this is still the case on the Continent. By this method a pure tin is obtained, but the loss of metal in the process is greater. It works best where coal is scarce and wood abundant.

Tin ores which contain the mineral wolfram (tungstate of iron and manganese) are treated by a special process, patented by R. Oxland, of Plymouth, England. This mineral and tin ore are so nearly the same in specific gravity that no mechanical process of washing will separate them. Oxland's process consists in roasting the dressed tin ore with sulphate of soda, for the purpose of converting the insoluble tungstate of iron and manganese into the soluble tungstate of soda, which is easily removed by lixiviation. The oxides of iron and manganese, which are left in a finely divided state, can then, from their lower density, be readily got rid of by washing. The tungstate of soda procured in the operation has been found to be one of the most valuable substances for rendering cotton cloths non-inflammable.

Tin Plate. A very large proportion of the tin obtained each year is employed in the plating of iron and steel sheets which are manufactured subsequently into cans for preserving and other purposes. The sheets from the rolling mills are cleaned in bran-water which has soured and in dilute sulphuric acid, after which they are plunged into baths of molten tallow and tin. The treatment with tallow prevents oxidation of the metal. After the sheets have taken on a sufficiently heavy plate, they are carefully cleaned with bran. An inferior quality of plate called terne plate is made by dipping sheets in an alloy of tin and lead.

Bibliography. For the occurrence and mining of tin, consult *The Mineral Industry* (New York, annual); Charleton, *Tin Mining* (London, 1884). For the metallurgy of tin, see Schnabel, *Handbook of Metallurgy*, vol. ii., Eng. ed. (London, 1878).

TINAMOU. The native, and now the popular, name for birds of the family Tinamidæ, inhabiting the tropical portions of South America, having many remarkable features in their internal organization, and the striking external character that the tail is exceedingly short or entirely absent. Like partridges in general appearance, and varying in size from that of a quail to the bigness of a large grouse, and prevailingly brown in color, they are classed as game-birds in South America, and are frequently called 'partridges.' Their flight is strong and swift, yet they haunt the undergrowth of dense forests or bushy and grassy flats, run with amazing rapidity, and conceal themselves with great skill, rather than take to flight. But they are rather stupid, and can be caught with a noose on the end of a stick, especially if they are approached on horseback. Their food is miscellaneous, like that of game-birds generally, and their voice a mellow whistle. The flesh is delicious. They make very simple nests on the ground, and lay eggs varying from reddish chocolate, wine-purple or liver-color, to dark blue or green, and burnished to a metallic sheen. A typical example of the group is illustrated on the Plate of CASSOWARIES, ETC. This is the 'great' tinamou (*Rhynchotus rufescens*), or 'perdiz grande,' of Argentina.

The tinamous have been regarded by many systematists as within or near the Ratitæ, but are placed by Gadow as a separate group of ordinal or subordinal rank among the Carinatæ, between the falcons and the quails. Consult: Gadow, "Aves," in Bronn's *Thier-Reich* (Leipzig, 1893); Evans, *Birds* (London, 1900); Newton, *Dictionary of Birds* (New York, 1896); Sclater and Hudson, *Argentine Ornithology* (London, 1889).

TINCTURE (from Lat. *tinctura*, a dyeing, from *tingere*, to dye, Gk. *τέγγειν*, *tengein*, to moisten, dye). A medicinal preparation of a drug by maceration or by dissolving non-volatile principles in alcohol. In some tinctures strong alcohol, in others dilute alcohol, is used. In almost all cases the resulting liquid is of a decided color; hence the name. Obviously tinctures must be kept in tightly closed bottles to prevent evaporation. They furnish a most convenient form for dispensing drugs, either alone or in combination. There are over 70 official tinctures in the United States Pharmacopœia. Among these are the once popular tincture of arnica, used for bruises and sprains, but much inferior to pure alcohol; compound tincture of cinchona, the equivalent of the old Huxham's tincture; tincture of the chloride of iron, the most widely used chalybeate; tincture of ipecac and opium, a liquid form of Dover's powder; compound tincture of lavender, an aromatic stimulant used in colic; tincture of myrrh, so largely employed in mouth washes and dentifrices; tincture of opium, or laudanum; camphorated tincture of opium, or paregoric; tincture of squill, familiar as a component of cough mixtures; and tincture of ginger, frequently known as 'essence of ginger.' There are also ethereal tinctures, in which the solvent used is ether in place of alcohol.

TINCTURE. The general designation for colors, metals, and furs in heraldry (q.v.).

TIN'DAL, MATTHEW (c.1653-1733). A deistical writer. He was the son of a clergyman at Beer-Ferris, in Devonshire, was educated at Oxford, and elected fellow of All Souls' College in 1678. After a brief lapse into Romanism during the reign of James II. he reverted to Protestantism, or rather, as events showed, into rationalism. It was not till 1706 that he attracted particular notice, when the publication of his treatise on *The Rights of the Christian Church Asserted Against the Romish and All Other Priests Who Claim an Independent Power Over It* raised a storm of opposition. On the Continent Tindal's work was quite differently received. Le Clerc, in his *Bibliothèque choisie*, praises it highly, as one of the solidest defenses of Protestantism ever written. In 1730 he published his most celebrated treatise, entitled *Christianity as Old as the Creation, or The Gospel a Republication of the Religion of Nature.* The design of the work is to strip religion of the miraculous element, and to prove that its morality is its true and only claim to the reverence of mankind. Tindal's book is written in excellent English, and is an able performance, giving its author a distinguished place among the eighteenth-century deists.

TINDER. An inflammable material, usually made of half-burned linen. It was formerly one of the chief means of procuring fire before the introduction of friction matches. The tinder was made to catch the sparks caused by striking a piece of steel with a flint; and the ignited tinder enabled the operator to light a match dipped in sulphur. This intermediate step was necessary in consequence of the impossibility of making the tinder flame. Partially decayed wood, especially that of willows and other similar trees, also affords tinder; and certain fungi furnish the German tinder, or amadou (q.v.).

TIN'EA (Lat., gnawing worm). A name given to several varieties of vegetable parasitic skin diseases. For *tinea favosa*, *see* FAVUS. *Tinea trichophytina* or *ringworm* may appear as an eruption on several parts of the body, receiving a modification of the name in each case, as *corporis*, *cruris*, *capitis*, *barbæ*, etc. It is very common among the poorer classes, and spreads with great rapidity in schools and asylums. Tinea of the scalp is often propagated by indiscriminate use of combs, hats, towels, and brushes, as well as by propinquity in sleeping. A red spot appears, marking the beginning of the eruption, which soon becomes scaly and enlarges, forming a ring possibly half an inch in diameter, leaving a clear centre. The margin of the circle is well defined, elevated, red, and covered with fine scales easily detachable. Mycelium and spores are seen in microscopic examination of the scales. There is seldom much irritation, except in the cases where the crotch or axilla is invaded. The *tinea trichophytina cruris* or *eczema marginatum* is not infrequent in the United States. In warm climates it is very common and severe, and is known as *Indian*, *Chinese*, or *Burmese ringworm*, also as *Dhobie's itch*. Hyposulphite of soda, bichloride of mercury, acetate of copper, and tincture of iodine are frequently efficacious in the *tinea corporis* and *cruris*. Bulkley recommended sulphurous acid for the latter. *Tinea capitis*, also called *tinea tonsurans*, is very intractable, and perseverance must be used in the application of carbolic acid, green soap, mercury, oil of cade, etc., always used in the form of an ointment. *Tinea versicolor*, or *Pityriasis versicolor*, is very common in warm countries, though also frequent in the United States. The front of the chest is most often attacked, the back next. The parasite

Microsporon furfur is probably the cause of *tinea versicolor*. The treatment consists of frequent bathing with strong soap, hyposulphite of soda applications, or the use of bichloride of mercury, salicylic acid, sulphur, and glycerin. The prognosis is good.

TINEIDÆ. See LEAF-MINER.

TINEL, tē′nĕl′, EDGAR (1854—). A Belgian pianist and composer, born at Sinay. In 1863 he became a pupil at the Brussels Conservatory, and ten years later he received the first prize for pianoforte and published four nocturnes for solo voice with pianoforte. In 1877 he won the Grand Prix with his cantata *Klokke Roeland.* He succeeded Lemmens as director of the Institute for Sacred Music at Mechlin, in 1881, and in 1888 produced the oratorio *Franciscus,* which gave him fame. In 1889 he was appointed inspector of the State music schools of Belgium and in 1896 became professor of counterpoint and fugue at the Brussels Conservatory. He produced a *Grand Mass of the Holy Virgin of Lourdes* for five parts; *Te Deum* for four-part mixed choir with organ; *Alleluia* for four equal voices with the organ; the music drama *Godoleva* (1896); motets and sacred songs. He also published *Le chant grégorien, théorie sommaire de son exécution* (1895).

TINGHAI, tĭng′hī′. The chief town of the island of Chusan (q.v.), China.

TINGITIDÆ. See LACE-BUG.

TINGUAITE, tĭn′gwȧit (named from Sierra de Tingua, Brazil). An igneous rock of granular or porphyritic texture, characterized by the mineral combination alkali feldspar, nepheline, and ægerine, or ægerine-augite. It is a rock of very limited distribution, but generally occurs in dikes associated with nepheline syenite, to which it is genetically and chemically related.

TINGUIANE, tĭn-gwē-ä′nȧ. A brown people in northern Luzon. See PHILIPPINE ISLANDS.

TINITIAN. A Malay-Negrito people in Palawan. See PHILIPPINE ISLANDS.

TINKER-BIRD, or TINKER BARBET. See COPPERSMITH.

TINKER'S ROOT. See FEVERWORT.

TINNÉ, tē′nȧ′ (Athapascan, people). A collective term sometimes used as synonymous with Athapascan stock (q.v.), but more usually employed to designate the tribes of that stock residing in the Canadian northwest, exclusive of the Kuchĭn (q.v.). In this restricted sense it includes the Sarsee, Taculli, Sicauni, Nehaunee, Beaver, Hare, Chippewayan, Montagnais, Slave, and others, who number in all about 12,000, chiefly on the waters of the Upper Yukon, Upper Mackenzie, Upper Fraser, Peace River, Athabasca River, and the lakes connected with them.

TINNÉ, tĭn′nȧ, ALEXINE (1839-69). A Dutch explorer in Africa, born at The Hague. In 1856 she visited Palestine, Syria, and Egypt, and having definitely removed to Cairo in 1861, started for the Upper Nile in January, 1862, and reached Gondokoro in September, but was compelled by sickness to return to Khartum. In February, 1863, she set out with an enormous train on a second expedition, with Bahr-el-Ghazal for its goal, in which Henglin and Steudner (1852-63) participated and which advanced as far as Dembo in the Bongo country. Steudner and Miss Tinné's mother having succumbed to the climate, the expedition returned to Khartum in March, 1864. Its results were described in the *Transactions of the Historical Society of Lancashire, etc.,* vol. xvi. (Liverpool, 1864). In 1865 Alexine Tinné visited Crete, Greece, and Italy, went to Algiers in 1866, traveled through the French Sahara in 1868, and in January, 1869, started with a strong retinue for the interior, intending to penetrate to the Nile via Bornu. Detained by sickness at Murzuk, she then proceeded toward Ghat by invitation of the Tuareg chief Ikhenukhen, but was assassinated by the Tuaregs escorting her, on August 1st. Consult: Henglin, in *Petermanns Mitteilungen, Ergänzungsheft 15* (Gotha, 1865); and id., *Reise in das Gebiet des Weissen Nil, etc.* (Leipzig, 1869).

TIN′NEVEL′LI or **TINAVELLY.** The capital of a district of Madras, British India, 99 miles southwest of Madura, on the left bank of the Tambraparni River (Map: India, C 7). It is connected with Palamcotta on the opposite bank by a handsome bridge. The most striking edifice is the Siva temple. There are two colleges, and the town has long been an important centre for Protestant missions. Cotton goods are extensively manufactured. Tinnevelli became a British possession in 1801. Population, in 1901, 40,469.

TINNI′TUS AURIUM (Lat., ringing of the ears). Ringing in the ears. In most cases it is an unimportant symptom, depending on some local temporary affection of the ear, or on some disturbance of the digestive system; but as it is also a common symptom of organic disease of the auditory nerve, it may indicate a dangerous condition, or may be a prelude to complete deafness. It may be a symptom of neurasthenia (q.v.), and may occur in a number of diseases. Hence, although commonly of no consequence, it is a symptom that, especially if permanent, must be carefully watched. It may be readily induced for a few hours by a large dose of quinine or of the salicylates.

TINOCERAS. A huge proboscidean, allied to Coryphodon, Dinoceras and Uintatherium, found fossil in the Middle Eocene (Bridges) formations of Wyoming. Its most prominent characteristic was the long, narrow, somewhat quadrangular skull, bearing six great protuberances, one pair on the nasal bones pointing forward, a second outward-bending pair on the upper jaw-bones (maxillaries), and a third over the eyes (on the parietals), where there was a semicircular upright crest of bone. These protuberances seem not to have been covered with ordinary horn. The typical species is *Tinoceras ingens,* described by Marsh, *Dinocerata, a Monograph of an Extinct Order of Gigantic Mammals* (Washington, 1884).

TINOS, tē′nôs. One of the Cyclades. See TENOS.

TINTERN ABBEY. One of the most beautiful monastic ruins in England. It is situated in a green meadow on the right bank of the River Wye, nine miles below Monmouth, on the spot where Theodoric, British King of Glamorgan, was said to have fallen in battle against the heathen Saxons, A.D. 600. The abbey was founded in 1131 for Cistercian monks by Walter de Clare;

the church was begun a century later through the munificence of Roger de Bigod, Earl Marshal, and dedicated in 1268. The tower and roof are gone; but the church remains one of the finest examples of the Decorated Style—the English High Gothic—beautiful in composition and delicate in execution. The nave is 228 feet long, the transept 150, and the width of nave and choir, 37 feet. The ruins of the convent buildings also remain. Tintern Abbey is well known through Wordsworth's celebrated "Lines," composed a few miles above Tintern Abbey.

TINTO, DICK. (1) An artist, the son of a village tailor, introduced in Scott's *Bride of Lammermoor*, and *St. Ronan's Well*. (2) The nom de plume of Frank Booth Goodrich.

TIN'TORET'TO, Il (1518-94). The name usually applied to Jacopo Robusti, one of the chief masters of the Venetian Renaissance. He was born at Venice, the son of a dyer (*tintore*), whence his name, and at an early age was placed with Titian. According to the traditional account, the jealousy of Titian soon forced him to leave; but their separation was more probably due to Tintoretto's different point of view, which saw in the plastic rendition of the human body in action, rather than in color, the chief problem of art. Taking an independent atelier, he subjected himself to one of the severest courses of training on record. Following his great aim, as announced in the motto upon the wall of his studio, to unite Michelangelo's design with Titian's color, he provided himself with casts from which he drew constantly, and he even brought Daniele da Volterra's models of Michelangelo's tomb from Florence. He dissected bodies to learn anatomy, studied foreshortening and motion from suspended figures, worked by day and lamplight to get light effects, and did not scorn to learn from house painters the secrets of their technique. Besides the color of Titian he studied especially the work of his friend Schiavone, from whom he acquired the technique of fresco, and perhaps also Bonifazio Veronese, whose influence appears in his early works.

After such extensive preparation his intense eagerness for activity led him to solicit work at low prices. His earliest works, which are rare, show progress from the dark manner of Schiavone and Bonifazio Veronese to a greater transparency of color. The first work to attract attention was a lost portrait of his brother and himself with night effect, but the most important surviving example is a "Circumcision" in Santa Maria del Carmine. Somewhat later he painted five subjects from Genesis for Santa Trinità, two of which, the "Fall," and the "Murder of Abel," are preserved in the Venetian Academy, the former especially being idyllic in sentiment, and almost equal to Titian in color. After a number of façades, none of which survive, his next work of importance was the decorations of the choir of the Madonna del Orto, 50 feet in height, and the "Last Judgment." Finally, his reputation was definitely established by the series of pictures in the Scuola di San Marco relative to the abduction of the body of the patron saint of Venice from Alexandria to Venice. The episodes represented the "Finding of the Body" (Brera, Milan), its "Abduction from Alexandria," "Saint Mark Saving a Saracen from Shipwreck" (both in the Royal Palace, Venice), and "Miracle of Saint Mark" (Academy, Venice). All show Tintoretto at the height of his powers, especially the last, which so good a critic as Taine esteemed the greatest painting in Italy. It is especially remarkable for the intense dramatic actions and the treatment of the light, which issues from the saint's head and shoulders, lending rich color to the well modeled groups.

Tintoretto very seldom dated his works, and there is, consequently, no record of his activity between 1550 and 1560. It is probable, however, that during this period he painted a large number of his easel pieces, and perhaps the three grand compositions in the Ducal Palace, which were burnt in 1577. In 1560 began his remarkable activity for the guild of San Rocco, whose *scuola* (guild house) forms a perfect museum of his works, of which it and the adjoining church contain fifty-six in all, painted at different periods of his life. In 1565 he finished the "Crucifixion," a splendid piece of naturalism, and one of his very best works; in 1577 the two panels of the ceiling of the great hall: the "Paschal Feast," and "Moses Striking the Rock." Meanwhile he had become a member of the guild, and in 1577 he was employed at a salary of 100 ducats to furnish three pictures a year, which he continued to perform until his death. Among the best are a series from the life of Christ, including a strikingly original "Visitation," "Annunciation," "Christ Before Pilate," "Christ Bearing His Cross," "Ecce Homo," and a "Resurrection."

In the decorations of the Ducal Palace, begun about the same time (1560), he was extensively aided by pupils, especially by his son Domenico. In the Sala del Scrutinio he painted the "Capture of Zara;" in the Antecollegio, four charming mythological representations: "Bacchus, Ariadne, and Venus," "Mercury and the Graces," "Minerva Expelling Mars," and the "Forge of Vulcan;" in the Sala del Collegio, four votive pictures of doges, the finest of which represents the "Marriage of Saint Catharine;" and in the Hall of the Senate, "Venice, Queen of the Seas." In the Hall of the Grand Council the Doge and Senate offer the spoils of the conquered cities to "Venice in Glory," and the four battle pieces of the ceiling show keenest effects of foreshortening. There, too, a whole wall is occupied by his last great work, the "Paradise," 74 × 30 feet, the largest oil painting in the world, but which has suffered so much from the ravages of time and restoration as to be scarcely enjoyable.

His altar-pieces and easel pictures are legion, and may be found in the churches of Venice and principal galleries of Europe. We can mention only the three fine examples in San Giorgio Maggiore; "Susanna's Bath," in Vienna, Paris, and Madrid; "Vulcan, Cupid, and Venus" (Pitti, Florence); and "Abraham's Sacrifice" (Uffizi); "Origin of the Milky Way" and "Saint George and the Dragon" (National Gallery, London); "Diana and the Hour" (Berlin); and "Christ Visiting Mary and Martha" (Augsburg), one of his loveliest works. During the same period he also designed for Saint Mark's Church a series of mosaics over the arch and elsewhere of subjects from the life of Christ.

Tintoretto shared with Titian the reputation of being the greatest portraitist of his day. His early portraits, indeed, are often confounded with

Titian's, but he soon developed a highly individual style, the keynotes of which are naturalism and simplicity. Eliminating all incident, even gesture, the great painter of motion produced likenesses in the highest sense typical. With incredible rapidity he painted the doges and the nobility of Venice, who were his sitters. Of these portraits over one hundred survive, to say nothing of the important examples which we know were lost, but many of which were probably executed by his son, Domenico. Among the best examples are his own likeness in the Louvre and in the Uffizi; Vincenzo Morosini, Paolo Paruto, Tomaso Contarini, and Niccolò Priuli, in the Ducal Palace; the doges Trevisan and Priuli, Jacopo Soranzo, Andrea Dandolo and Antonio Capello, in the Academy of Vienna; the Doge Niccolò da Ponte Sebastiano Venier, the hero of Lepanto, a "Young General," and a number of admirable unknown portraits, in the Vienna Gallery.

The adverse opinion of some critics upon Tintoretto's works is due to the effect of time upon them. He used a dark ground and applied the colors but lightly, with the result that they are greatly darkened. His marvelous rapidity of execution often impelled him to do work which was sketchy, sometimes even negligent; but in his best work he shows himself one of the greatest painters of all times. His was, in a way, the culmination of Renaissance painting, and he united in himself more than did any other man all of its different tendencies. Tintoretto extended the plastic character to the entire composition, and Titian's color harmony of flat surfaces became with him a light symphony of the whole painting. By his mastery of light and shadow he was enabled to put a world of poetry and sentiment in his pictures, without, however, degenerating into illustration. He possessed a fertility of imagination unexcelled in the history of painting. His most startling innovations, however, were in composition; for the problem is far more difficult in Tintoretto's plastic work than in the relief-like productions of other masters. Sometimes he separated foreground and background, using the action in the latter to concentrate attention on the principal action in the foreground. In dramatic power he is the worthy compeer of Michelangelo, his impetuous energy having gained him the title 'Il Furioso,' and like him he indicated emotion by the action of the body.

Excepting a year's stay at Mantua, Tintoretto passed all of his life at Venice. Before 1560 he married Faustina dei Vescovi, who seemed to have her share of worry in taking care of her spouse, who was impracticable in money matters. Of his eight children, MARIETTA, the eldest, a gifted artist and his favorite child, met with an early death in 1590, whence the beautiful tradition of the old painter painting his dead daughter. He did not long survive her, and died at Venice, May 31, 1594. His son and assistant DOMENICO painted many works in superficial imitation of his father.

BIBLIOGRAPHY. The chief literary source for Tintoretto's life is Ridolfi, *Meraviglie dell' arte* (Venice, 1648). The first among modern writers to establish his fame was Ruskin in *Stones of Venice* and other works. Janitscheck's biography, in Dohme, *Kunst und Künstler Italiens* (Leipzig, 1876), is a scholarly work, but not strong from the artistic side; see also Osler, in the *Great Artists Series* (London, 1879). Brief but more critical are Berenson, *Venetian Painters* (New York, 1894), and Pratesis in *Nuova Antologia* (1890). The latest works are those of Stearn (New York, 1894) and Thode (Bielefeld, 1901), the latter the best that has yet appeared.

TIN WEDDING. See WEDDING ANNIVERSARIES.

TINY TIM. In Dickens's *Christmas Carol*, a cripple, the little son of Bob Cratchit.

TIPPECANOE, tĭp'ê-kȧ-nōō'. A popular nickname of General William Henry Harrison, due to his victory over the Indians at the Tippecanoe River in 1811.

TIPPECANOE, BATTLE OF. An engagement fought on November 7, 1811, near the site of the present village of Battle Ground, on the Tippecanoe River, in Tippecanoe County, Ind., between an American force of about 800, including 500 Indiana and Kentucky militiamen, under William Henry Harrison, then Governor of Indiana Territory, and an Indian force, estimated by Harrison at about 6000, but probably much smaller, under the actual command of White Loon, Stone Eater, and Winnemac. About 1808 Tecumseh and the Prophet, his brother, established a village on the Tippecanoe River, and with this as their headquarters endeavored to bring all the Indian tribes of the West and Southwest into a confederation which should decide, in any given case, upon the alienation of Indian lands. Much discontent was caused among the followers of Tecumseh and the Prophet by the Indian land cessions of 1809, and the danger of an Indian outbreak became daily more imminent. On October 11, 1811, while Harrison was building a stockade on the site of Terre Haute, one of his sentinels was killed from ambush, and Harrison, considering this the beginning of hostilities, soon afterwards marched against the town on the Tippecanoe, where the Prophet was supposed to be inciting the Indians to attack the whites. On the night of November 6th he encamped within about a mile of the town, and posted his troops in the form of an irregular parallelogram, having previously arranged with the Prophet for a conference on the following day. Before dawn on the 7th the Indians attacked the camp with great ferocity and bravery, but after more than two hours of stubborn fighting were driven from the field. On the following day Harrison advanced to the town, found it deserted, and almost completely destroyed it. He then returned to Vincennes. The loss of the whites in the battle in killed and wounded was about 190; that of the Indians, though undoubtedly large, is not definitely known. At the time of the battle Tecumseh was in the South endeavoring to persuade the Creeks, Choctaws, and Cherokees to join his projected confederation. The battle rendered virtually impossible the realization of Tecumseh's plans, weakened and almost destroyed the prestige of the Prophet, hastened the general outbreak of hostilities by the Indians against the Americans in the Northwest, and greatly enhanced the reputation of General Harrison, who later, partly on the strength of this success, was placed in command of the American troops in the West. Consult Pirtle, *The Battle of Tippecanoe* (Louisville, 1900), No. 15 of the "Filson Club Publications."

TIP′PERA′RY. An inland county of the Province of Munster, Ireland, lying north of Waterford (Map: Ireland, C 4). Area, 1659 square miles. The county for the most part is in the basin of the river Suir. Other rivers are the Shannon, the Nore, the Nenagh, and the Brosna; lakes are numerous, but of small size. The surface is generally level. The Galtees Mountains which diversify it are rather groups than portions of any connected range; these mountains rise to 3000 feet. The soil of the plain is fertile; there is a considerable amount of bog in the central and eastern districts. The mineral productions are coal (anthracite), copper, and lead, also zinc and good fire-clay; slates of an excellent quality are quarried near Killaloe. Wheat was formerly grown in large quantities; but of late years its cultivation has been superseded by dairy-farming and the raising of cattle. Population, in 1841, 438,150; in 1891, 185,217; in 1901, 159,754.

TIPPERARY. The capital of Tipperary County, Ireland, on the Arra, 111 miles southwest of Dublin (Map: Ireland, C 4). It occupies a central position in a fine country, and carries on an extensive trade in butter. The town, of ancient origin, is well built, and contains Roman Catholic and Protestant churches, national schools, and a school of the Erasmus Smith endowment. In 1890 the foundation of a New Tipperary, now in ruins, was an attempt, under the Irish League's plan of campaign, to boycott the land proprietor of the old town. It proved abortive within a year. Population, 7000.

TIPPU SAHIB, tē-po͞o′ sä′hĭb (1749-99). Sultan of Mysore, in India. He was a son of Hyder Ali (q.v.). He was actively engaged in the wars of his father, and routed the British at Perimbakum (September 10, 1780), and on the banks of the Kolerun in Tanjore (February 18, 1782). On the death of his father in 1782 he was crowned Sultan and returned at once to the head of his army, which was then operating against the British near Arcot. On April 28, 1783, he captured and put to death the garrison of Bednore. The peace between England and France deprived him of his French allies and he made a treaty in 1784 on the basis of the *status quo*. He then gave his attention to the internal affairs of Mysore, establishing a splendid court at Seringapatam. He sought, in 1787, to bring on a renewal of the war between France and England, and failing, invaded in 1790 the protected State of Travancore. In the ensuing war (1790-92) the British, under Colonel Stuart and Lord Cornwallis, were aided by the Mahrattas and the Nizam, who joined in the struggle against their powerful neighbor both out of fear and religious hatred, Tippu being a fanatical Mohammedan. The Sultan laid waste the Carnatic and advanced almost to the gates of Madras, but was defeated near Seringapatam in March, 1792, and compelled to cede one-half of his dominions, pay an indemnity of 3000 lacs of rupees, restore all prisoners, and give his two sons as hostages for his fidelity. Nevertheless, his secret intrigues against the British were almost immediately resumed. Hostilities began in March, 1799, and two months after Tippu was driven from the open field and attacked in his capital of Seringapatam, which was stormed on May 4th, the Sultan himself being slain after an heroic resistance. His dominions and property were confiscated, a portion of Mysore, however, being assigned to the Nizam. Consult Bowring, *Haidar Ali and Tipú Sultán* (London, 1893).

TIP′TON. A town in South Staffordshire, England, 4½ miles southeast of Wolverhampton, with collieries, blast furnaces, and iron manufactures. Population, in 1891, 29,314; in 1901, 30,543.

TIPULIDÆ. See Crane-Fly.

TIPWORM. The larva of one of the gall-midges (*Cecidomyia oxycoccana*), which occurs in the terminal buds of the cranberry plant and causes them to become unusually prominent and to stop the development of the leaves. After attack the tip usually dies. The adult fly has a red abdomen and a grayish thorax, and is about one-sixteenth of an inch in length. The female has a long, extensive ovipositor by means of which she thrusts her eggs into the heart of the young shoot. The larva is a minute orange-red or yellow grub. See also Hop Insects.

TIRABOSCHI, tē′rȧ-bôs′kē, Girolamo (1731-94). An Italian author, born at Bergamo. He studied at Monza, and became a Jesuit. He was appointed professor of rhetoric at Milan, where he wrote his first work, *Vetera Humiliatorum Monumenta* (1766), and in 1770 succeeded Father Granelli as librarian to the Duke of Modena. Tiraboschi now availed himself of the rich stores of the ducal library, besides making extensive researches in other archives, to compose his *Storia della letteratura italiana* (1770-82, in 14 vols.). It embraces the history both of ancient and modern Italy, and is especially valuable for the light it throws upon the intellectual condition of the Peninsula during the Dark Ages, and the brilliant period from Dante to Tasso. Tiraboschi ends his elaborate survey with the close of the seventeenth century. Abridged translations have appeared in French and German. Other works by him are *Biblioteca modenese* (1781-86) and *Memorie storiche modenesi* (1793).

TIRARD, tē′rär′, Pierre Emmanuel (1827-93). A French statesman, born in Geneva, where he learned the goldsmith's trade. He went to Paris about 1846, and in 1870 became mayor of the Sixth Arrondissement. In 1876 he entered the Chamber of Deputies as a radical Republican and he was successively Minister of Agriculture and Commerce (1879-81, and in 1882), Minister of Finance (1882-85), and Premier (1887-88 and 1889-90). Subsequently he resumed the seat in the Senate to which he had been elected in 1883. From December, 1892, to April, 1893, he was Minister of Finance in Ribot's Cabinet.

TIRASPOL, tē-räs′pôl. A town in the Government of Kherson, South Russia, on the left bank of the Dniester, 73 miles by rail northwest of Odessa (Map: Russia, C 5). It manufactures flour, brick, pottery, and ironware, and has a large trade. Population, in 1897, 27,585.

TIREE, tĭ-rē̆′, or **TYREE**. A Scottish island, one of the Inner Hebrides (q.v.), included in Argyllshire, 20 miles northwest of Iona (Map:

Scotland, B 3). It is 13 miles long, and over 6 miles in extreme breadth. The surface is low and destitute of trees; but the soil is fertile. There are interesting antiquities, which include Scandinavian forts, standing stones, ruined churches, and ancient graves. The inhabitants support themselves by rearing cattle, fishing, and exporting poultry and eggs. Population, in 1901, 2195.

TIREH, tē′re. A town of the Turkish Vilayet of Smyrna, Asia Minor, 25 miles southeast of the city of Smyrna, with which it has railway connection (Map: Turkey in Asia, B 3). It is the ancient *Tyrrha* of the Kingdom of Lydia. Tapestry and cotton manufacturing constitute the chief industries. Population, estimated at from 13,000 to 20,000.

TIRE′SIAS (Lat., from Gk. Τειρεσίας, *Teiresias*). In Greek legend, a famous Theban seer. He is called son of Eueres and Chariclo, and was blind from early youth, because he had seen Athena bathing. To recompense him for his loss of sight, the goddess gave him power to understand the voices of birds. Another legend represents Hera as depriving him of his sight because, being made arbiter in a dispute between her and Zeus, he had decided in favor of the latter; when Zeus as a compensation gave him unerring power in interpreting omens, and prolonged life. He appears prominently in the Theban cycle of legends, and was said to have died from a draught of water from the prophetic spring Tilphusa, after the capture of Thebes by the Epigoni, while accompanying some of the vanquished Thebans to another home. In the *Odyssey* (book xi.) we are told how Odysseus went to the lower world to consult him.

TIRHAKAH, tēr-hä′kȧ. A king of ancient Ethiopia. See Taharka.

TIRLEMONT, tērl′mōɴ′ (Flem. *Tienen* or *Thienen*). A town in the Province of Brabant, Belgium, 29 miles east by south of Brussels, on the Geete River (Map: Belgium, C 4). Its walls, which had a circumference of about six miles, were dismantled early in the nineteenth century. The chief objects of interest are the recently restored churches of Saint Germain and Notre Dame du Lac. The former is a composite of the Romanesque and early Gothic, and was begun in the ninth century. Its most striking feature is the altar-piece by Wappers. The Church of Notre Dame du Lac dates partly from the thirteenth and partly from the fifteenth century. There are manufactures of engines, leather, cotton and woolen goods, etc. Population, in 1900, 17,855.

TIRNAU. See Tyrnau.

TIRNOVA, tēr′nō-vȧ (Bulgarian *Trnova*). A district town in the Principality of Bulgaria, situated on the Yantra and the Sofia-Varna Railway, 124 miles northeast of Sofia (Map: Balkan Peninsula, E 3). It contains a number of mediæval churches. The chief industries are dyeing and the manufacture of copper ware. Tirnova was the capital of Bulgaria for about two centuries until 1393, when it was taken by the Turks. Population, about 13,000.

TI′RO, Marcus Tullius. Slave, pupil, and subsequently amanuensis of Cicero, whose life he wrote and whose letters he collected. He is known chiefly as the inventor of the ancient stenography (see Shorthand), called after him *notæ Tironianæ*. He died at almost a hundred years of age.

TIROL, tē-rōl′. A crownland of Austria. See Tyrol.

TIRSO DE MOLINA, tēr′sō dā mō-lē′nȧ. The pseudonym of the Spanish dramatist Gabriel Tellez (q.v.).

TIRURAYE, tē′rōō-rä′yȧ. A Malay people in Cotabato Province, southwestern Mindanao. See Philippine Islands.

TI′RYNS (Lat., from Gk. Τίρυνς). An ancient city of Argolis, in the Peloponnesus, situated a short distance southeast of Argos, near the head of the Argolic gulf. According to tradition it was founded by Prœtus, a mythic king of Argolis; and its massive walls, like other rude massive structures in Greece of unknown antiquity, were reputed to be the work of the Cyclopes. Later, Perseus was said to have ruled here, and the place was the residence of Hercules while in servitude to Eurystheus. At the time of the Dorian conquest Argos seems to have secured the supremacy over the plain, though during the Persian Wars Tiryns appears independent and sent troops to Platæa. Some time subsequently, probably about the year B.C. 468, the city was taken by the Argives; after this period Tiryns remained uninhabited, the walls of the citadel only being left standing, the wonder and admiration of later ages. The acropolis or citadel of Tiryns was built on the summit of a low, flat, rocky hill, about 980 by 330 feet in extent, which rises abruptly out of the dead level of the plain of Argos to a height of from 30 to 60 feet. It consists of three terraces, of which the highest was occupied by a prehistoric palace, the middle by lesser buildings, while the lowest has been scarcely explored, but seems to have contained only small structures. This hill was surrounded by a massive wall of huge blocks of limestone of irregular shape, laid in a clay mortar. The original height is uncertain, though in some places it is still nearly 25 feet. The thickness around the lower terrace is not quite uniform, but does not exceed 26 feet; around the upper terrace it varies from 16 to the prodigious figure of 57 feet. A part of this wall was occupied by galleries and chambers probably for the storing of provisions. The main entrance was on the east, and was reached by a ramp; on the west was a postern gate with a stairway in the rock. The palace on the summit was excavated by Schliemann and Dörpfeld in 1884-85, and until the recent discoveries in Crete was the most complete example of the home of a Mycenæan king. After passing the entrance gate, the way leads to a large propylæa, which opens into a great open court; from this a second gateway leads to another paved court (αὐλή, *aulē*), surrounded by colonnades. On one side low steps and a door lead to a vestibule, which again opens into the great hall (μέγαρον, *megaron*), with a circular hearth in the centre. Around this central structure is a complex of passages and lesser rooms, including a bath, and a smaller court with its own *megaron*, possibly the women's apartments. The essential identity of this palace with that described in the Homeric poems lends peculiar interest to the discovery. Consult: Schliemann, *Tiryns* (London, 1886); Schuchhardt, *Schliemann's Excavations*, trans. by

E. Sellers (London, 1891); Perrot and Chipiez, *Histoire de l'art dans l'antiquité*, vol. vi. (Paris, 1894).

TISCHBEIN, tĭsh'bīn. A German family of artists who lived in Hesse during the eighteenth century. JOHANN HEINRICH, the Elder (1722-89), a painter, born at Haina, was first a pupil of the Court painter Freese, in Cassel, and then studied under Van Loo, Boucher, and Watteau at Paris. In 1748 he entered the studio of Piazzetta in Venice. Returning to Cassel in 1751, he became Court painter to the Landgrave and director of the New Academy (1776). His historical pictures and portraits were weak, but there were few better among the best works of the time in Germany. Examples are: "Lessing" (c.1760, Berlin), "Count Waldner von Freundstein" (1761, Versailles), "Augustus and Cleopatra" (1769, Cassel), and "Belisarius" (1786, Oldenburg).—JOHANN FRIEDRICH AUGUST (1750-1812), also a painter, nephew of the preceding, was born in Maestricht. He studied with his uncle and in Paris and Italy. Afterwards he became Court painter in Waldeck and then director of the Leipzig Academy (1800). His canvases include nine portraits of princes and princesses of Orange-Nassau (Amsterdam), and a portrait of Schiller (1804; Leipzig).—JOHANN HEINRICH WILHELM, the Elder (1751-1829), a painter and etcher, also known as "the Neapolitan," cousin of the preceding, the most celebrated of the family, was born at Haina. He studied with his uncle, Johann Heinrich, and in Hamburg, Bremen, and Holland. Through the aid of Goethe he went to Italy, and accompanied the poet to Naples in 1787. There he was patronized by Sir William Hamilton and served as director of the Academy (1789-99). In 1809 he was made Court painter to the Duke of Oldenburg. At Eutin he painted the 43 "Idyls" (Oldenburg) which Goethe celebrated in verse. Among his paintings are a portrait of Goethe (Frankfort); "Conradin of Swabia Hearing His Sentence" (1784); "An Italian Landscape" (1819, Oldenburg); and a portrait of himself (Hanover). Tischbein issued about 150 etchings and engravings in connection with various publications. Consult Michel, *Etude biographique sur les Tischbeins* (Lyons, 1881).

TISCHENDORF, tĭsh'en-dôrf, KONSTANTIN VON (1815-74). One of the most eminent biblical scholars of the nineteenth century, born at Lengenfeld, Saxony. He was educated at the Gymnasium of Plauen and at the University of Leipzig. In 1840, now a privat-docent at Leipzig, he published his Greek Testament (dated 1841), and then went to Paris, where for over two years he labored incessantly among the manuscript treasures of the National Library. In 1842 the publication of the Greek text of the palimpsest Codex Ephraemi, followed soon after by his edition of the Codex Claromontanus, marked him as a textual scholar of the first rank. Though he became a professor of theology at Leipzig, the greater part of his time was spent in journeys in search of biblical manuscripts or in the work of editing and publishing the same. The great triumph of his life was the discovery (in 1859) in the library of the monastery of Saint Catharine, at Mount Sinai, of the second oldest manuscript of the Greek Old and New Testaments known, the fine uncial *Codex Sinaiticus*. A sumptuous edition of the whole manuscript in four large folio volumes was published in 1862 at the expense of the Emperor of Russia. The crowning work of Tischendorf's life was his eighth edition of the Greek Testament with its large critical apparatus, the indispensable *vade mecum* of every student of the text of the New Testament. Tischendorf's numerous publications may be found, with a sketch of his career, in the Prolegomena to the eighth edition by Dr. C. R. Gregory.

TISHRI, tĭsh'rē. A month in the Babylonian, Persian, and Jewish calendars corresponding to the Seleucid *Hyperboretaios*, September-October. The Babylonian name *tish-ri-tum* is regarded as derived from *shurru*, to begin, to dedicate, the civil year having begun in the autumn with this month, while the ecclesiastical year seems to have begun in the spring with the month of Nisan. Tishri is not mentioned in the Bible, but the name is found in the Mishna treatise, *Shekalim*, iii. 1, and probably in Josephus, *Antiquities*, viii. 4, 1. The Jewish civil year begins with the month of Tishri.

TISIO, tē'zē-ō, BENVENUTO. The correct name of the Italian painter called Benvenuto Tisio da Garofalo (q.v.).

TISSAPHERNES, tĭs'sȧ-fẽr'nēz (Lat., from Gk. Τισσαφέρνης, from OPers. **Cithrafarnā*, possessed of manifold glory) (?-B.C. 395). A Persian, appointed satrap of the coast-lands of Asia Minor by Darius II. in B.C. 414. He played a part by intrigue and arms in the Peloponnesian War. He became the jealous rival of Cyrus the Younger on the latter's arrival in Asia Minor in B.C. 407, and when it became manifest that Cyrus was plotting against his brother, King Artaxerxes II., and aiming at the throne, Tissaphernes was the first to inform the King of the impending danger. He held a command in the Persian Army and distinguished himself at the battle of Cunaxa. After the death of Cyrus he entrapped the generals of the Greek mercenaries of the Prince. He then succeeded to the provinces that had been held by Cyrus, but was unsuccessful in an attempt to establish his authority over Ionia. Finally, through the influence of Parysatis, the King's mother, Tissaphernes was put to death at Colossæ, in Phrygia, in B.C. 395.

TISSERAND, tĭs'räN', FRANÇOIS FÉLIX (1845-96). A French astronomer, born at Nuits-Saint-Georges, Côte-d'Or. In 1863 he entered the Ecole Normale Supérieure. In 1866 he became professor in the lycée at Metz, where he only remained one month, being called by Leverrier to the Paris Observatory as adjunct astronomer. He received his doctor's degree in 1868, presenting a very remarkable thesis on the method of Delaunay, which he showed to be applicable to the calculation of the inequalities of all the planets and thus of a wider application than had been supposed by the inventor. In 1873 he became director of the observatory at Toulouse and professor of astronomy in the Faculty of Sciences in the university. In 1878 he succeeded Leverrier as member of the Academy of Sciences and became member of the Bureau des Longitudes. In the same year he was appointed professor of rational mechanics at the Sorbonne, which he later exchanged for the chair of celestial mechanics. In 1892 he succeeded Mouchez as director of the Paris Observatory.

Besides the generalization of the method of Delaunay which he continued till his death, he made observations for the determination of planetary orbits, on the ring of Saturn, on the perturbations of Pallas, the origin of comets and their capture by the larger planets, and gave also a valuable criterion for identifying a periodic comet. He also observed the shifting of the orbital plane of Neptune's satellite as a result of Neptune's ellipsoidal shape. In consequence of this shifting of orbit, the retrograde motion of the pole of the satellite completes a cycle in 500 years. His principal work, *Traité de mécanique céleste* (1889-96), gives a complete account of the state of knowledge of that branch of astronomy up to the time of his death. Since 1884 he edited the *Bulletin astronomique*. His other writings include: *Recueil d'exercises sur le calcul infinitésimal* (1876; 2d ed. 1896). Consult Poincaré, "La vie et les travaux de F. Tisserand," in *Revue générale des sciences* for 1896.

TISSOT, tĭs'sō', JAMES JOSEPH JACQUES (1836-1902). A French painter, born at Nantes. He studied at the Ecole des Beaux-Arts under Lamothe and Flandrin, and first exhibited in 1859. After the Commune, in which he was accused of having taken part, he went to London and spent twelve years in England, where he became known as an etcher and a painter of portrait and genre subjects. Until he was fifty years old Tissot's work dealt principally with the worldly aspects of Parisian life. The drawing in these works is always careful, and the coloring exact and finished. Examples of this style are "Faust and Marguerite" (Luxembourg) and "La Femme à Paris." Experiencing a change in his religious views about 1886, he left Paris and passed ten years in Palestine. The results of this were the 300 and more water-color studies representing the life of Christ, which are now in the possession of the Brooklyn Institute. It is an attempt to portray the real environment of Christ, the cities, buildings, and habits of the country, as they must really have been in His time, instead of their ordinary conventional treatment by artists. The details are painted with miniature faithfulness, and the Oriental character of the subject is fully carried out. At the time of his death Tissot had begun a similar set of illustrations from the Old Testament.

TISSUE, ANIMAL. See HISTOLOGY.

TISZA, tĭs'sŏ, KÁLMÁN (KOLOMAN) (1830-1902). An Hungarian statesman, born at Geszt, County of Bihar. He studied law and entered the Government service. In 1855 he accepted a semi-ecclesiastical position in the Reformed Church and in 1859 he vigorously combated the attempt of the Austrian Minister of Public Worship, Count Leo Thun, to curtail the autonomy of the Protestant Church in Hungary. In 1861 he was elected to the Diet from the city of Debreczin and soon became the recognized leader of the opposition. Long opposed to the Ausgleich, Tisza finally, in 1875, united his followers with the Deák party and organized the new Liberal Party, which recognized the existing situation and sought to make the most of it for Hungary. In the Wenckheim Cabinet he assumed the portfolio of the Interior (March, 1875), becoming Premier in October. He held this position for fifteen years, having at his back a more harmonious political support than any other leader in the dual monarchy. He retired from the Ministry in 1890, but continued his political leadership and was regularly returned as a Deputy from the city of Grosswardein until 1901. His leadership throughout his administration was conspicuously successful. He was an upright patriot and an able financier, and to him more perhaps than to any other one man was due the industrial and financial progress of his country. Consult his biography by Visi (Budapest, 1886).

TITA'NIA. (1) An epithet of Latona, as the daughter of the Titan Cœus. Ovid uses the name of Diana and of Pyrrha, daughter of Epimetheus. (2) In Shakespeare's *Midsummer Night's Dream*, the fairy queen, wife of Oberon.

TITANIC IRON ORE. See ILMENITE.

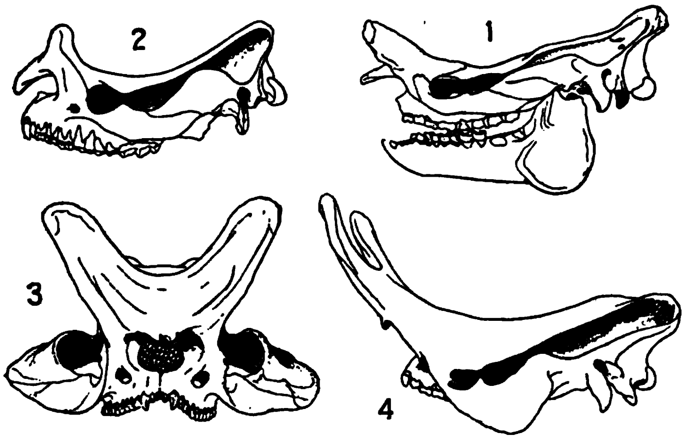
TITANITE (from *titanium*). A mineral calcium-titanium silicate crystallized in the monoclinic system. It has a resinous lustre, and is brown or black in color. It usually occurs in crystals embedded in granite, gneiss, mica schists, granular limestone, or in beds of iron ore and volcanic rocks. It is found in the Saint Gotthard region, in Switzerland, Finland, and Ireland. In the United States it occurs in numerous localities along the Appalachian Mountains from Maine to North Carolina. The name titanite is usually given to the brown or black varieties in distinction from the lighter colored titanite called *sphene*. The transparent and colorless varieties are frequently cut as gem stones.

TITANIUM (Neo-Lat., from Lat. *Titan*, from Gk. Τιτάν, Titan). A metallic element discovered by Gregor in 1789. It is not found native, but as the oxide in the minerals anatase, brookite, and rutile; in combination with iron as ilmenite, and as the silicate with calcium in titanite. In smaller quantities it also occurs in other minerals. It is prepared by heating the potassium titanofluoride (obtained from rutile) with potassium or sodium out of contact with air.

Titanium (symbol, Ti; atomic weight, 48.15) is a dark-gray amorphous powder resembling reduced iron, with a specific gravity of 1.25. When heated to redness in the air it burns with an intensely brilliant white light. It decomposes boiling water, and is soluble in dilute acids. Metallic titanium is distinguished from almost all other elements by its peculiar capacity for uniting with nitrogen at a high temperature. This promises a cheap means of preparing ammonia direct from the atmosphere. Titanium gives hardness and toughness to steel and a fine lustre to silver, while added to carbon used for arc lamps, it increases the brilliancy of the light. It combines with oxygen to form a dioxide, a trioxide, and a sesquioxide. Of these the dioxide is found native and combines with bases to form titanates.

TITANOSAURUS, or ATLANTOSAURUS. A genus of extinct, sauropodous, herbivorous dinosaurs (q.v.), found fossil in the Jurassic rocks of the Rocky Mountain region and Dakota, whose species were among the most gigantic land animals that ever existed, one specimen, exhumed in Colorado by O. C. Marsh, measuring about 60 feet long and standing about 30 feet high. The characteristics of the genus were similar to those of its near relatives Brontosaurus and Diplodocus (qq.v.).

TI'TANOTHE'RIUM (Neo-Lat., from Gk. *Τιτάν*, Titan + *θηρίον*, *thērion*, diminutive of *θήρ*, *thēr*, wild beast). The type genus of a family, Titanotheridæ, of ungulates, occurring in the Oligocene formations of North America, and comprising a number of species of gigantic animals somewhat resembling the rhinoceros in general form. Though belonging to the perissodactyles, they approximate the artiodactyles or even-toed ungulates in certain structural points, especially of the vertebræ and limb-bones. The most striking feature of the titanotheres is a pair of bony processes resembling horn-cores, which grow upward and outward from the maxillary bones above the snout. These prominences are variable in development according to age and sex, and also differ in size and form in different species to such an extent that many generic names, such as *menodus*, *brontotherium*, *brontops*, and *titanops*, have been bestowed upon forms which later study has shown to be only different stages in the evolution of the same genus. Careful comparative study of the remains from the White River Beds of Canada, South Dakota, Colorado, and Nebraska shows that during the Oligocene period the genus increased in size, and the horns, which are mere knobs in the (presumably) earlier types, such as *Titanotherium heloceras*, increased greatly in length, and became flattened and wide-spreading in the later species, culminating in the highly specialized *Titanotherium ramosum* and *Titanotherium platyceras*—the last survivors of their race. Of some forty specific names which various writers have proposed, often on the basis of a single fragmentary skull, only a few designate sharply marked species. One of the best-known titanotheres is *Titanotherium robustum*, a form with moderately developed horns, which measured nearly 14 feet in total length, and eight feet in height at the shoulder.



EVOLUTION OF THE TITANOTHERES.

1, Skull of *Titanotherium bucco*; 2, cranium of *Titanotherium coloradense*; 3, Front view of cranium of *Titanotherium platyceras*; 4, lateral view of same. (OSBORN.)

TITANS (Lat., from Gk. *Τιτάν*, *Titan*, and *Τιτανίς*, *Titanis*, connected with Lat. *titio*, firebrand, and perhaps with Lith. *titnagas*, flint, Skt. *titha*, fire, glow). The offspring in Greek mythology of Uranus (heaven) and Gæa (earth). Their names as given by Hesiod were: Oceanus, Cœus, Crius, Hyperion, Iapetus, Cronos, Theia, Rhea, Themis, Mnemosyne, Phœbe, and Tethys; Dione, Phorcys, and Demeter are added by some writers. As Uranus imprisoned in the earth the Cyclopes and Hekatoncheires (hundred-headed monsters), Gæa in anger instigated the Titans to revenge. Cronos alone ventured to act. He surprised and mutilated his father and reigned in his stead. As Uranus had called down a like fate on the Titans, Cronos swallowed his children by Rhea as soon as they were born. Only Zeus escaped, his mother giving Cronos a stone wrapped in swaddling clothes. On growing up, Zeus forced Cronos to disgorge his offspring, and then began a war, in which he was aided by Themis, Mnemosyne, Styx, Prometheus, the Cyclopes and Hekatoncheires, as well as his own brothers and sisters. Iapetus and Cronos are the representative Titans. After a long struggle the conquered Titans were cast into Tartarus and guarded by the Hekatoncheires. In the *Prometheus Unbound*, Æschylus represented the Titans as released and reconciled to Zeus, now firmly established as King of Heaven. The name Titan is also given to the descendants of the Titans, such as Prometheus, Hecate, Helios, Selene, etc. The whole story seems the result of an endeavor to account for the obvious signs of natural convulsions so frequent in Greek lands. It is certainly not a tradition of the supplanting of an old Cronos religion by a new Zeus religion.

TITCHENER, tĭch'nẽr, EDWARD BRADFORD (1867—). An American psychologist, born at Chichester, England. He was educated at Malvern School and at Brasenose College, Oxford, where he took the B. A. and M. A. degrees in due course. After studying at Leipzig, he became assistant professor of psychology in 1892, and professor in 1895 at Cornell University. There he built up the laboratory of experimental psychology to a point of almost unexcelled efficiency. He made numerous original investigations in the spheres of sensation, affective process, attention, and action. He wrote: *An Outline of Psychology* (1896), *A Primer of Psychology* (1898), and *Experimental Psychology* (2 vols., 1901); and translated Külpe's *Outlines of Psychology* and other works. Professor Titchener became the American editor of *Mind* in 1894, and associate editor of the *American Journal of Psychology* in 1895.

TIT'COMB, TIMOTHY. A *nom de plume* used by J. G. Holland.

TITE, Sir WILLIAM (1798-1873). An English architect. He was born in London, where he was educated, and studied architecture under David Laing. His first work, assisting in rebuilding the Church of Saint Dunstan-in-the-East in the Gothic style (1817-20), established his fame. Among his best designs was that of

Edward Irving's church in London (1827-28), and he was the architect of the Royal Exchange (1841-44), and of several palatial railway stations in France and England. He was knighted in 1869. He was a man of varied attainments, a member of several learned societies, and published *A Catalogue and Description of the Antiquities Found in the Excavations for the Royal Exchange* (1848), and several essays and lectures.

TITHES (AS. *tēoþa*, a tenth part, from *tēon*, *tien*, *tȳn*, ten, Goth. *taíhun*, OHG. *zehan*, Ger. *zehn*, ten; connected with Lat. *decem*, Gk. *δέκα*, *deka*, Ir. *deich*, Skt. *daśa*, ten). A tenth part of the produce of the land, which has from the earliest times been a rate in a system of taxation for civil and religious purposes. Tithing is still the prevailing method of taxation in Mohammedan countries. It was established and definitely regulated for the support of religion among the Hebrews. For the details of the Hebraic institution of tithes see Lev. xxvii. and Deut. xiv., where it is provided that the tribe of Levi, not having lands assigned to them as was the case with the other tribes, should draw their support from this system of taxation.

In the usage of the Christian churches tithes have been one of the methods employed in providing for the support of the clergy. (See Stipends, Clerical.) The system, though strongly urged as of moral obligation by the Apostolic canons, the Apostolic constitutions, and the writings of the Fathers, was for many centuries purely voluntary; and the legislation of the first Christian emperors, while it presupposed the duty of maintaining the clergy, did not extend to any general enactment for the payment of a tenth of the produce of the land. Many Church councils in the sixth, seventh, and eighth centuries confirmed the system; and at length the Emperor Charlemagne, by his capitularies at the beginning of the ninth century, formally established the tax within that portion of the ancient Roman Empire to which his legislation extended.

The introduction of tithes into England is ascribed to Offa, King of Mercia, at the end of the eighth century; and the practice was made general for all England by Ethelwulf, about the year 850. It would seem that at first, although all were required to pay tithes, it was optional with each to select the church to which payment should be made; but by a decretal of Pope Innocent III. addressed to the Archbishop of Canterbury in the year 1200, all were required to pay tithes for the support of the clergy of their respective parishes, and this parochial distribution of tithes has ever since obtained in England. Consult Whitehead, *Church Law* (London, 1892).

TITHING. A territorial or personal division in early English history. The territorial tithing, a tenth part of the hundred (q.v.), dates from early Anglo-Saxon times. The personal tithing probably came in with the Normans, though many give it a place in Anglo-Saxon polity. It consisted of ten men mutually responsible for one another, with a head pledge or tithing man to represent the whole. (See Frank-Pledge.) This officer survived as a petty parish official long after the system to which he owed his origin had decayed.

TITHO'NUS (Lat., from Gk. Τιθωνός). In Greek legend, a son of Laomedon and brother of Priam, who was carried off by Eos (the Dawn). She bore him Memnon, and obtained from the gods for him the gift of immortality. The Homeric hymn to Aphrodite adds that as Eos forgot to ask for eternal youth as well, Tithonus withered into helpless old age, until he remained in her chamber behind closed doors, and only his piping voice was heard. A very late account told of his final transformation into a cicada.

TITIAN, tĭsh'an (It. Tiziano Vecelli or Vecellio) (1477-1576). The most celebrated and important painter of the Renaissance in Venice. He was born at Pieve di Cadore, a small town in the Alps of Friuli. The year of his birth has been variously given, the most probable assumption (1477) being based upon his own statement in a letter to Philip II. of Spain. His family, the Vecelli, belonged to the petty nobility, and had long been identified with the public service in Pieve, Titian's father, Gregorio, being honorably known as a magistrate and military commander. At nine the lad was sent to Venice to be educated. He was first apprenticed to the mosaicist Sebastiano Zuccato, then to Gentile and Giovanni Bellini, having Giorgione and Palma Vecchio as fellow pupils. Titian was slow to develop. While Giorgione lived, he was content to follow in his footsteps. His work also had much in common with that of Palma Vecchio, but in this case Titian was probably the controlling influence.

During the first part of Titian's early period, lasting till 1512, his style resembles that of Giorgione; but Titian is a more rugged individuality, and his lines and colors are not so soft and melting. Among his earliest surviving paintings are a "Madonna with Saints" (Liechtenstein Collection, Vienna); a "Holy Family" (National Gallery, London); and the so-called "Gypsy Madonna" (Imperial Gallery, Vienna). They show uncertainty of drawing, but high charm of color. The first of his pictures that can with surety be dated is "Pope Alexander VI. Commending Jacopo Pesaro to the Madonna" (1502-03, Antwerp). A higher phase of technical development is shown by the "Madonna with the Cherries" (Imperial Gallery, Vienna), and the Madonnas with Saints at Dresden, Paris, Florence (Uffizi), and London (National Gallery). The "Concert" in the Uffizi has been attributed to him and the "Tribute-Money" (Dresden), representing the well-known incident between Christ and the Pharisee (see Giorgione), is the most carefully finished of his pictures. Only Leonardo has created a Christ type that can vie with this in gentleness, intellect, and majesty, and the contrast between it and the cunning coarseness of the Pharisee is especially striking. The Uffizi also possesses his "Daughter of Herodias," for whom Titian's daughter sat as model. Other celebrated works are the beautiful allegory of the "Three Ages" (Bridgewater Gallery, London), and at the end of the period, summing up its best qualities, is "Sacred and Profane Love," perhaps more properly called "Medea and Venus." In the midst of a beautiful landscape two maidens of similar mien sit at a sculptured antique fountain, while a Cupid plays in the water. One maiden is clothed, the other is nude, and the picture gives fine opportunity for the contrast in the play of light upon the two figures.

The façade frescoes of the Fondaco dei Tedeschi

(1507-08), which Titian executed as an assistant of Giorgione, have perished, but of those in Padua several survive, though not well preserved. One is in the Scuola del Carmine, and in the Scuola del Santo he depicted three miracles from the life of Saint Anthony (1511). It was probably after his return to Venice in 1512 that he painted the well-known altar-piece of Santa Maria della Salute, representing "Saint Mark Enthroned" with four other saints.

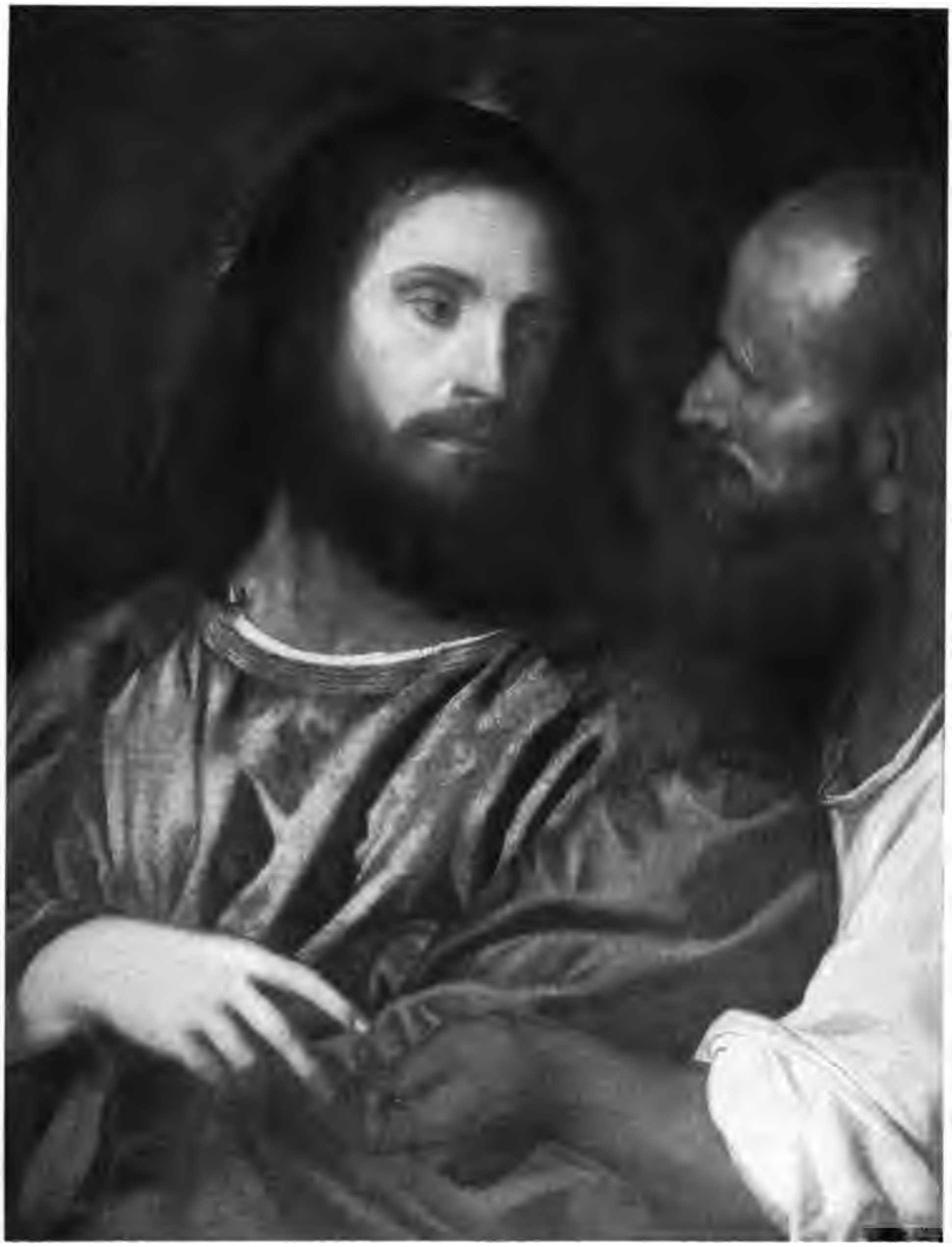
In 1513 Titian was summoned to Rome by Pope Leo X., but, preferring to remain at Venice, he petitioned the Senate to grant him a position like that of Giovanni Bellini, who was official painter to the State, and a commission to paint a large battle-piece in the Hall of the Grand Council. This petition was granted, but when, upon the death of Bellini, Titian was named his successor, with a yearly pension of 300 crowns, he neglected the promised battle-piece. He did, however, complete Bellini's picture, the "Submission of Barbarossa," in 1522, and executed a series of frescoes in the Chapel of the Ducal Palace—both of which were destroyed in the great fire of 1577, but his fresco of "Saint Christopher" (1523) still survives.

The work executed between 1513 and 1530 may be classed as belonging to a second part of Titian's early period. It still shows reminiscences of Giorgione, but also an increasing realism, breadth of treatment, and mastery of color. To this period belong most of his great religious altar-pieces, beginning with the "Assumption of the Virgin," formerly over the high altar of the Church of the Frari. Its position called for an over life-size figure and great breadth of treatment, the effects of which are lost in the present position of the picture in the Venetian Academy. The lower part is a scene of great exaltation among a group of the Apostles, the figures of Peter and John being particularly strong. Above the Virgin rises to the heavens in an effulgence of golden light, surrounded by hosts of the most beautiful angels imaginable. The chief attraction of the Madonna painted for San Niccolò dei Frari (1523, Vatican Gallery) is the six fine figures of saints in the lower part of the picture. The most perfect and important of his madonnas is probably the "Pesaro Madonna" (1526), still in the Frari. This very original composition represents the Madonna seated on the side of the picture at the base of a mighty column, where several saints commend to her the members of the Pesaro family. The celebrated "Death of Peter Martyr" (1530), destroyed by fire in 1867, showed in its violent dramatic action the influence of Michelangelo. To the same period, probably, belong the "Noli me tangere" (Christ appearing to Magdalen), in the National Gallery, London; the delightful "Madonna with the Rabbit," "Holy Family," and the grandly dramatic "Entombment"—all in the Louvre.

Among Titian's mythological pictures of this period, chiefly painted for Alfonso, Duke of Ferrara, are the "Worship of Venus," in which numberless little Cupids disport themselves before a statue of Venus, a "Bacchanal" (both at Madrid), and "Bacchus and Ariadne" (National Gallery, London), a highly dramatic representation. As State painter he had the monopoly of portraying the Doge. His official portraits perished in the fire of 1577; but many replicas survive, like that of the Doge Gritti (Czernin Collection, Vienna). He found also a generous patron in Alfonso d'Este, Duke of Ferrara, whose reputed portrait, lately declared to be that of his son, Ercole II., is at Madrid. At Ferrara he also painted the fine likeness of the poet Ariosto (National Gallery), and perhaps the idealized portrait widely known as "Alfonso d'Este (Ercole II.?), and Laura Dianti" (Louvre), formerly called "Titian's Mistress." The same model is portrayed in the Flora (Uffizi) with wonderful effect of light draperies. Other celebrated portraits belonging to this period are the "Young Man with a Glove" (Louvre), the portrait of an unknown man (Munich), and the so-called Alessandro de' Medici (Hampton Court).

The death of his wife, Cecilia, in 1530 was the cause of change in Titian's mode of life. In the quiet northeastern quarter of Venice he purchased a house which he furnished with great magnificence, and which speedily became the centre of a famous literary and artistic circle, which even kings were glad to join. Titian has been much blamed for his friendship with Aretino, whose advice perhaps increased his besetting sin, the love of wealth. In painting, his treatment grew broader and his work more powerful, and while his ideals grew more sensuous and realistic, it was a gracious and dignified sensuality. In 1531 he painted in the Ducal Palace the celebrated picture of the "Doge Andrea Gritti Presented to the Virgin by Saint Mark," and in 1537 he at length finished the great battle-piece of Cadore, both destroyed in the fire of 1577. The celebrated "La fede" (1555), a votive offering of Doge Andrea Grimani, had a better fate. Other decorative works are the ceiling of the choir and sacristy of Santa Maria della Salute, and the wonderful figure of "Wisdom," on the ceiling of the library of Saint Mark (now the Royal Palace). Splendid decorative canvases of unusual size are the "Presentation of the Virgin in the Temple" (Venetian Academy) and the realistic "Ecce Homo" (Vienna).

In 1532 he was summoned to Bologna to portray Charles V. and performed his task with such success that he was named Court painter, Knight of the Golden Spur, and Count Palatine, with the privileges of the Spanish Court, and his children were made nobles of the Empire. One of his portraits of the Emperor painted at this time (1533), representing him with his dog, is at Madrid. Other celebrated portraits of this period are those of "Ippolito de' Medici" (Pitti Palace, Florence), the "Maltese Knight" (Madrid), and a "Young English Nobleman" (Uffizi). Very fruitful for Titian's art were his relations (1532-38) with the Duke of Urbino, whose portrait in full armor, as well as that of his wife, Eleanora Gonzaga, is in the Uffizi. With most subtle flattery he portrayed the lady's rejuvenated features in the celebrated "La bella di Tiziano," perhaps his finest female portrait, in the "Girl with a Fur Cloak" (Vienna), and in the world-renowned "Venus of Urbino" (Uffizi), a rival of Giorgione's Venus, and the most beautiful representation of refined voluptuousness in modern painting. For the Duke he also portrayed Francis I. (Louvre). In 1545, after invitations from the Pope, Titian visited Rome, where he was received with



TITIAN
"THE TRIBUTE MONEY," FROM THE PAINTING IN THE ROYAL GALLERY, DRESDEN

highest honors. Of his portraits of Paul III. an original is at Saint Petersburg and an excellent copy in the Naples Museum, which also possesses his unfinished picture of the Pope and his two nephews. At Rome he met Michelangelo, whose influence may be seen in the "Danaë" (Naples), painted there. Other famous works executed about this time are the more realistic "Venus" of the Uffizi and a similar figure listening to music, at Madrid.

In 1548 Titian was summoned by the Emperor Charles V. to Augsburg, and there he painted his equestrian portrait in full armor (Madrid)—a wonderful characterization of the irresistible but disappointed master of Europe and the New World. Another portrait of Charles V. (1548), in black costume, is at Munich. At the same time Titian portrayed the captive John Frederick, Duke of Saxony (Vienna), and Cardinal Granvella (Besançon). On a second summons to Augsburg, in 1550, he painted the portrait of Philip II. as prince in armor (Madrid). He enjoyed the extreme intimacy of the world-weary Charles V., and together they designed the "Trinity," the Emperor's last commission. After his death Titian continued to serve his son, Philip II.

It is impossible to mention even the important works of Titian during the last period of his long career (1530-76). Among religious pictures some of the most celebrated are a "Magdalen" (Pitti Palace); a "Madonna with Saint John and Catharine" (National Gallery), celebrated for the landscape; "Christ at Emmaus" (Louvre); "Saint Margaret," and several others at Madrid. His mythological subjects include the celebrated "Venus and Cupid" (Borghese Gallery, Rome), and "Venus del Pardo" (Louvre), representing in reality "Jupiter and Antiope." Of his innumerable portraits we mention only those of his beloved daughter Lavinia with a dish of fruit in Berlin, as a bride and as a matron—both at Dresden; of himself at Berlin, Florence, and Madrid; his friend Aretino (1545, Pitti); Doctor Parma and the antiquarian Strada, in Vienna; and the splendid Cornaro family (Duke of Northumberland).

Titian's last pictures were chiefly religious, like the "Saviour of the World" (Saint Petersburg) and the grand "Pietà" (Academy, Venice), finished after his death by Palma Giovane. In his hundredth year he was stricken by the plague, August 17, 1576. He was buried in the Frari Church, where a fine modern monument marks his resting place. His son Orazio, an able painter and his faithful assistant, soon followed him. For Titian's pupils, see PAINTING.

If, as is the modern custom, painting be judged by the pictorial qualities only, then surely Titian is the greatest painter of Italy, if not of all times. All Venetian art centred in him. Certain painters of Venice and of other schools have equaled Titian in single pictorial elements, but no one united all these qualities with the same degree of excellence. His color is bright, but deep and transparent; a splendid golden tone suffuses his pictures, which only in his later works tends toward a more sombre brown. Light and shade, atmosphere and perspective are all perfectly rendered, and his rapid, sweeping handling, in place of the ancient detailed finish, revolutionized painting, preparing the way for Rembrandt and Velazquez. Being a Venetian, he was not as scientific a draughtsman as the Florentines, though at best his drawing is good. His composition is always good, and at best it is excellent. He did not attempt, like the Tuscans, to make art the vehicle of intellectual ideas, but his grasp upon life was firmer than theirs, and his art was wider in scope. He preferred an art that was tranquil and serene, though at times—witness the "Assunta" and the "Peter Martyr"—he could be profoundly dramatic.

If Giorgione was the founder of the modern landscape, Titian did more for its development, achieving the highest perfection before Poussin and Claude. Eliminating the detail of former painters, he rendered the typical in a landscape with high poetic charm. Though he used landscape as only a setting for his figures, he rendered it in itself perfect and complete. His favorite subjects were the Alps of his native Cadore and the lagoons of Venice. Titian was one of the greatest portrait painters of all times. He could render a portrait with the baldest realism, but at the same time with noble and striking characterization. He was the great painter of kings and nobles.

BIBLIOGRAPHY. Among the earlier works on Titian are those of Ticozzi (Milan, 1817), Hume (London, 1829), and Northcote (ib., 1813). By far the most complete and erudite contribution is that of Crowe and Cavalcaselle (ib., 1879-81), which should, however, be corrected by Morelli, *Italian Painters* (London, 1892). The other chief work on Titian, that of Lafenestre (Paris, 1888), is remarkable for its acute criticism. Consult also Max Jordan, in Dohme, *Kunst und Künstler Italiens* (Leipzig, 1878); Heath, in *Great Artists Series* (London, 1879); Barfold (Copenhagen, 1889); the very excellent contributions of Phillips, in the *Portfolio* (1897-98); the monographs by Knackfuss (Bielefeld, 1897) and Gronau (Berlin, 1900); and the popular commentary by Hurll (Boston, 1901). See also the notes in Blashfield and Hopkins's translation of Vasari's *Lives* (New York, 1896).

TITICACA, tē'tē-kä'kȧ, LAKE. The largest lake in South America (Map: America, South, C 4). It is situated on the boundary of Peru and Bolivia, being about equally divided between the two countries. It lies in a large and lofty lacustrine basin inclosed between the main Andean range and the Cordillera Real, with cross ranges on the north and south. This basin has an average elevation of 13,000 feet, and the surface of the lake itself lies about 12,500 feet above the sea. The lake has a length of 130 miles with an average breadth of 30 miles. It is divided by promontories into three unequal parts, and contains several islands. The depth in some places reaches 700 feet, but large portions of it are shallow, and the shores, especially in the south, are lined with marshy tracts covered with reeds. The vegetation along the shores is otherwise scanty, and the surrounding country is bleak and treeless. The lake receives a number of streams from the surrounding mountains and discharges through the Desaguadero into Lake Aullagas, whose waters finally evaporate in the great salt marshes in the southern part of the closed basin. In former ages the lake occupied the whole of the basin. Its surface stood then much higher, and it discharged eastward into the Amazon. The region around Lake Titicaca was one of the seats of early Indian civilization, and contains many interesting architectural remains, some of which antedate the Incan periods. The most imposing of the ruins are those of Tiahuanaco (q.v.). (See Peruvian Antiquities; Peruvian Archæology.) The lake was formerly navigated only by crude Indian rafts, but since the opening of a railroad to Arequipa and the Pacific Coast steamboats have plied on it. Consult: Pentland, *The Laguna de Titicaca* (London, 1848); *Proceedings of the American Academy of Arts and Sciences* (Philadelphia, 1876).

TITIENS, tĕt'yĕns, Teresa. See Tietjens.

TITIES. One of the three patrician tribes of ancient Rome, the others being the Luceres and Ramnes.

TITI-MONKEY, or Tee-tee. A small South American squirrel-monkey (q.v.) of the genus Chrysothrix or Callithrix; but the word is often used for a marmoset. They are gentle, beautiful, playful little creatures in great repute as pets in their own country, but too delicate to survive in cold climates.

TITLARK (from *tit*, from Icel. *tittr*, little bird, probably connected with Eng. *tit*, small thing + *lark*). A small, brown, terrestrial bird (*Anthus Pennsylvanicus*) of the wagtail or pipit family (Motacillidæ), allied to the larks, and familiar throughout North America during its migrations. It breeds, nesting on the ground, in the far north, and winters in the tropics, and in spring gives a pleasing song. A near relative is the 'Missouri skylark' (*Neocorys Spraguei*), of the Western plains, whose habits and song, uttered while soaring in the air, closely resemble those of the skylark. In this group come the numerous European wagtails (Motacilla), which keep near streams and flirt their long tails incessantly, and the pipits (Anthus), several species of which are among the most pleasing of European summer birds, frequenting fields, open spaces, and rocky slopes, and singing much like finches. Consult Coues, *Birds of the Northwest* (Washington, 1874).

TITLE (OF. *title, titre, tiltre*, Fr. *titre*, title, from Lat. *titulus*, title, superscription, token). The union of all the elements which constitute legal ownership of property, or the means by which a person holds property. The common-law authorities are to the effect that there are three essential elements to a complete title: possession, the right of possession, and right of property. This is technically true, but the latter two requisites are practically interchangeable, and it is customary to speak of title as consisting of possession with right of possession. (See Possession.) Title to property may be vested in one or a number of persons. All titles to real estate are acquired by *descent* or *purchase*. A title by descent is one which is acquired by an heir of a deceased person by virtue of the laws of intestacy and succession. Any other source of title is said to be by *purchase*. The latter term is used technically, as it includes other means than a bargain and sale, as, for example, a devise of property in a will. By virtue of the statute of limitations, twenty years' adverse possession of real estate will give the occupant a good title in most States. Title to patentable inventions is said to vest in the inventor by virtue of *original acquisition*, but the real source of ownership is really derived from the protection secured by the patent laws. A title may be capable of being established in a court of law and yet have such apparent defects as not to be readily salable. A court of equity will not compel a purchaser to accept a title which is not marketable. Consult the authorities referred to under Property; Real Property; Possession; etc.; and also see Tenure; Occupancy; Title, Registration of; etc.

TITLE, Registration of. A system of official examination and registration of titles to real estate prevailing in England and some of the United States. The present English system is the result of agitation and experimental legislation for upward of fifty years. The common-law methods of land transfer involved great expense and delay for searches, etc., and no satisfactory assurance of security on the passing of title. Prior to the legislation hereinafter mentioned, the practice in England was for a vendor to give a purchaser of land what was called a 'sixty years title,' that is, an abstract of his chain of title for a period of sixty years last past. A search made for a purchaser was not used again upon another sale, except possibly by way of comparison, and the enormous expense attendant upon the transfer of land was prohibitive of the conveyance of small tracts, and thus tended to keep lands in the hands of a few. The first act in England providing for registration of titles was passed in 1862. An immense amount of property was registered under this act. It was superseded in 1875 by a Land Transfer Act, which was designed to 'simplify titles and facilitate the transfer of land.' The act provided for the establishment of a Registry Office, to be in charge of an officer known as the Registrar, who was required to be a barrister of at least ten years' standing. Under its provisions any owner or person having power to sell land may apply to the Registrar to be registered as having an absolute or possessory title. If a purchaser applies for registration, the vendor must consent thereto. The Registrar is required to examine into the title, and the vendor may be required to establish his title by a *prima facie* case before the Registrar is obliged to pass on the validity of the title. Due notice of a hearing before the Registrar must be given to persons who have lodged 'cautions,' or notices of claim to the land, with the Registrar. The latter can compel the production of deeds and other documents to aid him in his determination. The land register should show all incumbrances on registered freehold property. Provision is made for indemnity for loss sustained through error in registration. A person registering property is given a certificate of that fact, and a purchaser is entitled to a land certificate. A proposed act for compulsory registration, introduced in 1895, was defeated. An important amendment to the act of 1875 was passed in 1897. One of its most important provisions is for the establishment of a 'real representative' of a deceased owner of real estate. The language of the act explains clearly this innovation: "Where real estate is vested in any person without a right in any other person to take by survivorship it shall, on his death, notwithstanding any testamentary disposition, devolve to and become vested in his personal representative or representatives from time to time as if it were a chattel real vesting in them or him." Another provision is for the administration of real estate as if it were personalty—the personal representative carries out the wishes of the testator subject to any claims against the estate, and this simplifies the system of registration. The English system is not yet perfect and titles are not as freely transferred there as in the United States.

Several of the United States have registration acts somewhat resembling the Torrens system (q.v.). Massachusetts has established a system under which two judges conduct hearings to establish title, and, on being convinced that a person has a valid fee-simple title, they may confirm the title and order its registration. Many of the English colonies have registration systems. Germany has a peculiar system under which a sort of ledger account of a title is kept. Most of the United States have systems for recording deeds and other instruments affecting real estate. A record of a deed or incumbrance serves merely to give constructive notice of its existence to the public, and does not involve any public guaranty as to the title. Consult: Morris, *A Summary of the Law of Land and Mortgage Registration;* Morris, *Registration of Titles.*

TITLE DEEDS. The instruments in writing which constitute the evidences of the title of the owner of real property. See DEED; CONVEYANCE; ABSTRACT OF TITLE.

TITLE INSURANCE. An agreement or undertaking by which the insurer, for a valuable consideration, contracts to indemnify the insured in a specified amount against loss or damage suffered because of defects of title to real estate in which he has some insurable interest. The business of title insurance is of comparatively recent growth. The first title insurance company was organized in Philadelphia in 1876, but the development of the business has been most rapid since about 1885. Contracts of title insurance are subject to the same rules as govern other classes of insurance contracts. The policy is usually granted upon written application, which is made a part of the policy and which contains statements or promises which are deemed to be warranties or conditions of the policy.

Generally the liability of the insurer is not limited in point of time, and the undertaking is to indemnify the insured against all loss or damage resulting from any defect in the title not known or specified in the policy, including defects in the chain of title and incumbrances of every description existing at the time the insurance is effected. When the undertaking of the policy is to indemnify against loss or damage only, the obligation incurred by the insurer is substantially like that of a grantor whose deed contains the usual covenants of warranty. (See COVENANT.) It is not unusual for the policy of title insurance to provide that the insurer shall take the property at an appraised valuation in the event that any defect of title is discovered rendering the title unmarketable.

There are also usually provisions contained in the policy that the insured shall notify the insurer of any claim or demand against the property founded on any defect of title insured against, and that the insurer shall be permitted to bring or defend actions in the name of the insured, but at its own expense, for the purpose of establishing that the title is free from such defect. When the insured is a mortgagor, provision may be made in the policy for the protection of a mortgagee of the property by a mortgagee's clause making the loss payable to the mortgagee, or the same result may be accomplished by issuing an independent policy in favor of the mortgagee.

There is no fixed method of ascertaining the amount of premiums in title insurance as is the case in life insurance. Experience has shown that the losses under title insurance contracts have been comparatively small, and that in fact an important benefit to be derived from the policy of title insurance in addition to the insurance features is the painstaking and exhaustive examination of the title made by the insurer. In many cases, however, the insurance feature is of great importance, since there may always be defects of title which an examination of the record title may not disclose. Many title insurance companies possess complete records and title maps of all real estate within the territory where they do business and have other special facilities for the expert examination of titles. The prospective purchaser of real estate within such territory, by applying for title insurance, may thus procure a complete examination of the title before the conveyance is made. The policy issued may, with the consent of the insured, be transferred to a subsequent purchaser of the property. This, however, is not customary except upon the payment of an additional premium. See INSURANCE; CONVEYANCE; DEED; COVENANT; RECORDING OF DEEDS. Consult Frost, *The Law of Guaranty Insurance* (Boston, 1900).

TITLES OF HONOR. Designations to which certain persons are legally entitled in consequence of possessing particular dignities or offices. Titles of honor may be divided into those of sovereignty, superior and inferior, nobility, greater and lesser, and titles of peculiarly official significance. Superior sovereign titles are emperor and king (qq.v.) and, in Turkey and Persia, sultan, and shah (q.v.). Czar and kaiser (qq.v.), from *Cæsar*, correspond to emperor. Inferior sovereign titles include grand duke (ranking next to king), duke, and prince (qq.v.) in some of the German States, and prince in Bulgaria, Montenegro, and Monaco. Eastern equivalents of the inferior titles are bey, khan (both post-positive), khedive, raja (qq.v.). Greater nobility titles include, in descending scale, prince, duke, marquis, count (earl in Great Britain), viscount, and baron (qq.v.). In Great Britain there is no title prince outside of the royal family. In Austria there is no duke, except archduke (q.v.) (of the Imperial family), and in a few princely houses, where the term remains as a subtitle, but is not used; in Germany, no viscount; in Russia, no viscount, marquis, or duke, except grand duke (of the Imperial family). Lesser nobility titles include baronet and esquire (qq.v.), peculiar to Great Britain, and knight (q.v.), chevalier, and ritter, the last three being practically equivalent terms. There are also lesser nobility titles for the chiefs of Scottish and Irish clans, and such Eastern titles as bey, effendi, and pasha (qq.v.), all three postpositive. The titles of honor having peculiarly official significance are largely such ecclesiastical, military, and governmental terms as archbishop, general, governor, etc. Courtesy titles, distinct from true titles of honor, since their validity rests in custom rather than law, are given to the sons of the British nobility. A noble takes his highest title and is permitted to set aside an inferior title, usually his second, to be assumed by his eldest son. The younger sons of dukes and marquises have the courtesy title lord (q.v.) prefixed to their given name or surname, and the daughters of dukes, marquises, and earls prefix lady. The younger sons of earls and the sons and daughters of viscounts and barons are called honorable.

Certain forms of reference are used in respect to various titles. Majesty is attributed to emperor and king, and to the former often Imperial Majesty; Imperial Highness to title of child of an emperor; Royal Highness to title of child of a king (in Great Britain also grandchild of the sovereign), and to grand duke and prince reigning; Highness, alone or variously qualified to prince; in Great Britain, Grace to duke. Lordship to any other peer (q.v.). See Forms of Address; Precedence.

TITMARSH, Michael Angelo. The *nom de plume* under which Thackeray published the *Yellowplush Papers* and other works.

TITMOUSE (from *tit*, from Icel. *tittr*, little bird + ME. *mose*, AS. *māse*, OHG. *meisa*, Ger. *Meise*, sort of song-bird). One of a family (Paridæ) of small active birds allied to the nuthatches, and familiar in the United States as 'chickadees.' The family is widely distributed and exhibits much variety in appearance and habits. Typical colors seem to be black, gray, and white, but many Old World species are distinctly marked, or suffused, with tints of blue, red, brown, or yellow, or several of these; and the Western American genus Auriparus (see Goldtit) is thus gayly colored. The females and young are closely like the males. These cheerful little birds are everywhere familiar, coming about gardens and roads, and nesting year after year in orchard trees, or some in garden bird-boxes, as well as in the forest. Their food consists mainly of insects, and they are everywhere of great service by their consumption of these, and, especially in winter, of the eggs and hibernating larvæ of aphids and other minute pests. Most of them make nests of soft materials in holes and crannies, but some, like the European penduline tit (see Plate of Pensile Nests of Birds in article Nidification), the long-tailed tits of the genus Acredula, and the Western American bush-tits (Psaltriparus), weave bag-shaped pouches of hempen materials, or of moss or grass, suspended beneath a tree branch. The breeding habits of the whole group are interesting. Their notes are sharp, quickly repeated exclamations, varied by a few sweeter calls, and are well illustrated by the familiar chickadees (*Parus atricapillus*, *Hudsonius*, and others), which are among the most characteristic of North American resident birds. Consult: Evans, *Birds* (London, 1900); and American ornithologies.

TITMOUSE.
Head of an Arizona crested titmouse (*Lophophanes Wollweberi*).

TITMOUSE, Tittlebat. See Ten Thousand a Year.

TITULAR BISHOPS (from Lat. *titulus*, title, superscription, token). In the Roman Catholic Church, bishops other than diocesan, who take their titles from some formerly existing but now extinct see. The practice of so designating them is due to the ancient principle of not consecrating bishops without a definitely assigned sphere of labor. With the multiplication of suffragan and missionary bishops, some such system of nomenclature was naturally, therefore, adopted. When the territory occupied by the Crusaders fell once more into Mohammedan hands, the expelled bishops were utilized in various parts of Europe, retaining their former titles; and these titles, with those of sees which broke away from communion with Rome in the great Eastern schism, are still employed to designate coadjutor or missionary bishops. In England until 1850, and in Scotland until 1878, the Roman Catholic bishops bore such titles, owing to legal and other difficulties in the way of assuming territorial titles. Titular bishops were formerly often known as bishops *in partibus infidelium;* but in 1881 Leo XIII. abolished the use of this name, on the ground that many of these sees had come into the hands of States which, if not Catholic, were Christian, and that the designation was inappropriate. See Suffragan.

TI'TUS. One of the most trusted and devoted of the disciples and fellow-workers of the Apostle Paul. Nothing is said of Titus in the Acts, and all we know of him is contained in scattered notices in Paul's Epistles, especially Galatians and II. Corinthians. He was of Gentile origin (Gal. ii. 3), converted to Christianity through Paul (Tit. i. 4), and was one of the brethren taken along by Paul and Barnabas on their mission from the church of Antioch to the mother church of Jerusalem at the time of the Apostolic Council (c.49 A.D.; cf. Gal. ii. 1 and Acts xv. 2). At Jerusalem, though he was uncircumcised, he appears to have been allowed to mingle freely with members of the mother church. It is reasonable to suppose that he returned to Antioch with Paul and accompanied him thence on his third missionary journey. From the notices in II. Corinthians we learn that he was sent by Paul from Ephesus on two, perhaps three, missions to Corinth, bearing letters and intrusted with the management of delicate and important business. In all respects he was completely successful. The Corinthians contributed liberally toward the great collection Paul was raising for the Jerusalem church, willingly obeyed Paul's injunctions in regard to cases of discipline, and evidenced most sincere love and loyalty to the Apostle. These results were supremely satisfactory to Titus and his report to Paul, who had left Ephesus (spring of A.D. 55) expecting to meet Titus at Troas, but, disappointed in this, had pressed on anxiously into Macedonia, so cheered the Apostle that he at once sent back the warm-hearted message contained in II. Cor. i.-iv. We know no more of Titus's movements until the time of the letter written to him by Paul. The date of this Epistle, presupposing its genuineness, must be placed between Paul's first and second imprisonments. (See New Testament Chronology.) Titus had accompanied Paul to Crete, where he had been left by the Apostle to further organize the churches there planted. He was summoned thence to join Paul at Nicopolis where Paul planned to winter. We do not know whether this plan was carried out. Titus is next mentioned in II. Timothy (iv. 10), the last of Paul's letters, as having departed, presumably from Rome, for Dalmatia. Nothing more is said of Titus in the New Testament. The impression made by the references given is that he was a true and capable assistant to the great Apostle, one of the foremost of that circle of loyal disciples through whom Paul accomplished his great work. Tradition makes him Bishop of Crete, but of this there is no early evidence.

TITUS (Titus Flavius Sabinus Vespasianus) (c.40-81 A.D.), Roman Emperor (A.D. 79-81). He was the eldest son of the Emperor Vespasian and Flavia Domitilla, and was born at Rome. Brought up at the Court of Nero, he received an excellent training, and subsequently, as *tribunus militum* in Germany and Britain, and commander of a legion in Judæa under his father, proved his qualities as a soldier and a general. On his father's elevation to the Imperial throne, Titus was left to prosecute the Jewish War, which he brought to a close by the capture of Jerusalem (September 8, A.D. 70) after a long siege. The news of the success was received with the utmost joy, and Vespasian's too jealous temper was awakened. However, Titus by returning to Rome, and laying the trophies of victory at the Emperor's feet, removed his unfounded suspicions, and father and son obtained the honor of a joint triumph (A.D. 71). About this time Titus became his father's colleague in the Empire. He gave himself up to the pursuit of pleasure in all its forms, put to death various suspected persons very summarily, and even caused one of his guests, whom he justly suspected of conspiracy, to be assassinated as he left the palace. On the death of his father (A.D. 79), whom he was at that time believed by a few to have poisoned, the Romans had satisfied themselves as to the advent of a second Nero. But Titus's behavior after his hand grasped an undivided sceptre completely belied their anticipations. The very first act of his reign was to put a stop to all prosecutions for *læsa majestas*, which had abounded since the time of Tiberius (q.v.). The ancient and venerated buildings of Rome were repaired; new ones, as the baths which bore his name, were erected; and the prominent tastes of the populace were abundantly gratified by games on the most stupendous scale, which lasted for 100 days. Titus's beneficence was unbounded, and it so happened that during his brief reign there was the most urgent need of its exercise. In A.D. 79 occurred the eruption of Vesuvius which overwhelmed Herculaneum and Pompeii and ruined numerous other towns and villages; in A.D. 80 a fire broke out in Rome, which raged for three days, destroying the Temple of Jupiter Capitolinus, which had just been rebuilt, and other public edifices, besides numerous houses; and in the tracks of these calamities followed a dreadful pestilence. Titus dealt out gifts with lavish hand to the houseless and ruined sufferers; he even despoiled his palaces of their valuable ornaments, to obtain money for distribution, and schemed and planned to furnish occupation for them. He was now the idol of his subjects, the 'love and delight of the human race;' but, unfortunately, in the commencement of the third year of his reign he became suddenly ill, and died at his patrimonial villa at Reate, in the Sabine country. The reign of Titus was marked by the extension of the Roman dominion in Britain by Agricola.

TITUS, Arch of. A triumphal arch in Rome at the highest point of the Sacred Way, facing the Forum, and situated between the platform of the Temple of Venus and Roma and the Temple of Jupiter Stator. It was erected by Domitian in A.D. 81 in commemoration of the taking of Jerusalem, and is adorned with fine reliefs on the inner sides of the archway, representing the triumph of Titus, and the spoils of the temple, including the seven-branched candlestick and the table with shewbread. During the Middle Ages the arch was built into the fortifications of the Frangipani; and when these were demolished, the arch was taken down in 1822 and rebuilt to insure its safety, the missing portions being supplied by travertine instead of the original Pentelic marble.

TITUS, Baths of. Extensive baths northeast of the Coliseum at Rome, built by Titus on the ruins of the Golden House of Nero and supplied by the Aqua Marcia. Their exact situation was long a matter of dispute, and they were generally conceived to be identical with the Baths of Trajan and to have been called by the latter name because restored by him. Excavations in 1895 finally determined their topography and showed them to be distinct from the adjoining Baths of Trajan. All remains of the building of Titus disappeared in the sixteenth century.

TITUS, Epistle to. A letter in the New Testament, attributed to the Apostle Paul. See Timothy and Titus, Epistles to.

TITUS ANDRONICUS. The name of a tragedy usually included among Shakespeare's works, though it is now generally considered to have been only retouched by Shakespeare in 1589-90, on the foundation of an earlier play. It is alluded to by Meres in 1598 among Shakespeare's tragedies; but, though a quarto edition is said to have been printed in 1594, no extant copy is earlier than the quarto of 1600. Crude as it is, it belongs to the same type of play as *Hamlet;* both are dramas of revenge, after the fashion of Kyd.

TI'TUSVILLE. A city in Crawford County, Pa., 18 miles north of Oil City; on Oil Creek, and on the Pennsylvania and the Dunkirk, Allegheny Valley and Pittsburg railroads (Map: Pennsylvania, B 2). It has a public library and a hospital. In August, 1859, the first oil well in the United States was sunk here, and the city is largely interested still in the oil industry. It has oil refineries, large iron works, radiator works, cutlery works, a silk mill, saw and planing mills, engine works, etc. It is also the shipping centre for a productive farming section. Under the charter of 1899, the government is vested in a mayor, elected triennially, and a bicameral council. The water-works and the electric light plant are owned and operated by the municipality. Titusville was settled in 1796, and was incorporated as a borough in 1847, and as a city in 1866. On June 5, 1892, Oil Creek, swollen by a cloudburst, flooded the lower part of the city. Soon afterwards several oil tanks gave way. The liberated oil, covering nearly the whole surface of the flood, became ignited, and the fire and flood together destroyed about 60 lives and fully one-third of the city. Population, in 1890, 8073; in 1900, 8244.

TIUMEN or **TYUMEN**, tyōō-mân′y′. A town in the Government of Tobolsk, Western Siberia, situated on the Tura, at the eastern end of the Perm-Tiumen Railway line (Map: Asia, F 3). It is an important centre in the transit trade of Siberia and has shipbuilding yards, woolen mills, and tanneries. Population, in 1899, 29,621.

TIV′ERTON. A municipal and Parliamentary borough and market-town in Devonshire, England, 14 miles north of Exeter (Map: England, C 6). There are important weekly markets, and great animal markets for cattle. There is a large lace factory, in which nearly 2000 hands are employed. The town owns the gas and water-works. Lord Palmerston was its Parliamentary representative for thirty years. Population, in 1901, 10,382. Consult Harding, *The History of Tiverton* (Tiverton, 1845-47).

TIV′OLI (Lat. *Tibur*). An old town of Central Italy, Province of Rome, 19 miles east-northeast of Rome. It stands on the slope of Monte Ripoli, one of the Apennines. Tivoli is walled, and has a fortress. The surrounding hills are covered with olive trees. The vines of Tivoli are famed for a peculiar sort of grape, in great request for its firmness and luscious flavor, noticed as early as the time of Pliny the Elder. The stone called travertine, of which a great part of Rome is built, comes from quarries just below Tivoli. On the western slope of the town lies the famous Villa d'Este, of the sixteenth century. Within and without the city there are many monuments of antiquity. In a commanding position above the falls of the Anio stand the remains of two temples, one circular (so-called 'Temple of the Sibyl'), and one rectangular (so-called 'Temple of Tiburtus'), the former of which antedates the Christian Era. In the neighborhood there are extensive remains of the Emperor Hadrian's magnificent villa, the 'villa of Mæcenas,' remains of mausoleums, aqueducts, bath, etc. The place is much visited by tourists for its waterfalls, which are lofty and very picturesque. The Anio furnishes excellent water power, which since 1892 has been utilized for electric lighting both at Tivoli and at Rome, and for iron works at the former town. Tibur existed as a town (according to ancient tradition) long before the building of Rome, under whose dominion it fell about B.C. 335.

TIXTLA, tēks′tlȧ, or TIXTLA DE GUERRERO. A town of the State of Guerrero, Mexico, five miles east of the capital, Chilpancingo (Map: Mexico, J 9). The town is in a fertile, well-watered valley, with silver mines in the vicinity. It was formerly the capital of the State. Population, in 1895, 6588.

TLACOTALPAN, tlä′kō-täl′pȧn. A Gulf seaport of Mexico, 50 miles southeast of Vera Cruz, at the mouth of the Papaloapân (Map: Mexico, L 8). Population, in 1895, 5770.

TLÁLPAM, tläl′pȧm. A town of the Federal District, Mexico, 10 miles south of the capital (Map: Mexico, J 8). It is a noted summer resort and each spring at Whitsuntide its Church of San Antonio de las Cuevas is visited by thousands of pilgrims. Population, in 1895, 5846.

TLATLAUQUITEPEC, tlȧ-tlou′kē-tȧ-pĕk′. A town of the State of Puebla, Mexico, 42 miles northwest of Jalapa. Population, in 1895, 8754.

TLAXCALA or **TLASCALA**, tlȧs-kä′lȧ (Mex., land of maize). The smallest State of Mexico, bounded by the State of Hidalgo on the north, Puebla on the east and south, and Mexico on the west. Area, 1595 square miles (Map: Mexico, K 8). The State lies within the central plateau of Mexico at an elevation of about 7000 feet above the sea. Several mountain peaks rise on the western and the southern frontiers and reach in the Sierra Malinche an altitude of 13,475 feet. The rivers are short and unnavigable. Tlaxcala has a comparatively cool climate, and frosts are not infrequent. The chief industry of the State is agriculture and the principal products are cereals, especially maize; maguey also flourishes. The State has good transportation facilities. Population, in 1900, 172,217. Capital, Tlaxcala.

The natives of Tlaxcala were of Nahuatlan stock (q.v.) and spoke the same language as the Aztecs, the dominant people of the Mexican Empire, but maintained their independence in spite of repeated attempts of the Aztec emperors to subjugate them. On the arrival of Cortez in 1519 he was at first fiercely resisted by the people of Tlaxcala, but they were defeated, and, submitting, furnished a large contingent to assist in the conquest of Mexico. In recognition of their services they were accorded special privileges under the Spanish Government, and on account of their loyalty and fighting qualities numbers of them were afterwards colonized at Saltillo, in Coahuila, and at Izalco, in Salvador, as a check upon the hostile inroads of the native tribes. The present population of Tlaxcala is chiefly of the aboriginal stock and language. They maintain many of their ancient beliefs and customs, including faith in witches and weather doctors, with an interesting Feast of the Dead.

TLAXCALA or **TLASCALA.** A Mexican town, the capital of the State of the same name, 58 miles east of the City of Mexico, on a branch of the Mexican Railway, running between Puebla and Apizaco, in the valley of the river Atoyac (Map: Mexico, K 8). The modern town, near the site of the Indian capital, has lost much of its former greatness. It contains the Statehouse, and the ancient bishop's palace, probably the oldest Franciscan building in America, while near it are many remains of former Indian structures. The magnificent sanctuary of Ocotlán is one of the landmarks of the surrounding country. The principal exports are grain, hides, and cloth. Population, in 1895, 2847.

TLAXIACO, tlȧ-syä′kô. A town of the State of Oaxaca, Mexico, 63 miles northwest of the city of that name, on the headwaters of the Atoyac (Map: Mexico, K 9). It is an important commercial centre. Population, in 1895, 8535.

TLEMCEN, tlĕm-sĕn′. The capital of an arrondissement in the Department of Oran, Algeria, near the Moroccan frontier. It is 80 miles southwest of the city of Oran, with which it is connected by rail, and stands in an undulating country, everywhere irrigated and highly cultivated (Map: Africa, D 1). It is also connected by rail with its port, Rashgun, 37 miles distant. The town is accessible only from the southwest, the other sides presenting steeply escarped fronts. It is protected from the south wind by a range of mountains, 4200 feet in height, and is surrounded by the ruins of its ancient battlemented wall. It contains Catholic and Protestant churches, magnificent mosques, synagogues, and a museum of interesting antiquities. The town is well supplied with spring water, and a basin under the walls 720 feet long by 490 feet wide and 10 feet deep, used for naval exhibitions by the ancient Tlemcen rulers, is now a reservoir. The district is covered with fruit trees of all kinds, of which the olive is one of the most valuable; cereals, tobacco, etc., are extensively produced. Besides the special markets, a daily market is held, at which cattle, wool, grain, and oils are sold. Ostrich feathers and cork are exported; and woolen goods, leather, saddles, slippers, and arms are manufactured. Population, in 1901, 35,468, of whom 24,234 were of native origin. Dating from 1002, Tlemcen has an interesting history under Berber, Arab, Spanish, and Turkish rule. It had about 100,000 inhabitants in the thirteenth century. It has been on the decline since the early part of the sixteenth century. The French ultimately occupied it in 1842.

TLIN′KIT (people), or KOLOSH (Russ., from Aleut *kalosh, kaluga*, little trough, in allusion to the enormous and peculiarly shaped labrets worn among them, especially by the Sitka). A group of tribes, of which the Chilcat, Sitka, Stikine, and Yakutat are the most important. They constitute a distinct linguistic stock known as the Kolushan, occupying the coast and islands of Southern Alaska from Mount Saint Elias southward to the entrance of the Nass River. The Tlinkit are a seafaring people with strongly marked characteristics. Before the demoralization wrought by the advent of the white man they lived in permanent villages of solidly constructed houses built of massive beams and great planks of cedar, each with its tall totem pole in front, and with the corner posts also carved in totemic designs. Their canoes were hewn from cedar trunks, and their mats and cordage were woven from the bark fibre of the same tree. They were expert stone-carvers and copper-workers. They were enterprising traders and controlled the trade from the coast to the interior tribes, using dentalium shells as a currency medium and setting great store upon the acquisition of property. They had three clans, the Raven, Wolf, and Whale, with descent in the female line, but the chieftainship was elective, being usually accorded to the most generous distributor at the great ceremony of the potlatch (q.v.). Slavery was an established custom, slaves from other tribes being a staple article of trade and treated by their masters with great cruelty. The dead were cremated, excepting in the case of priests, whose bodies were wrapped in mats and deposited with their sacred belongings in grave houses perched upon commanding cliffs. Their principal mythologic hero was the Raven, who brought fire to the people and set the sun and moon in their courses. The flesh of the whale was tabooed, excepting among the Yakutat. They did not flatten the head, as did the more southern tribes, but were addicted to labrets, which were considered marks of distinction and honor in proportion to their size, the insertion of each successive larger labret being the occasion of a potlatch distribution. They were a warlike race, strong and well built, and regarded by the Russians as of superior intellect, but have greatly deteriorated by contact with civilization. They may number now altogether 5000, and derive a large part of their subsistence by labor in the salmon canneries. Consult Krause, *Die Tlinkit Indianer* (Jena, 1885). See also SITKA; YAKUTAT.

TOAD (AS. *tādige, tādie*, toad; of unknown etymology). The common name applied to any one of the numerous species of tailless Amphibia belonging to the family Bufonidæ and a few kindred families. More than 100 species belong to the typical genus Bufo, which is nearly cosmopolitan, but most numerously represented in tropical America, and absent from Madagascar, Papuasia, and the islands of the Pacific Ocean. Toads differ from typical frogs (Raninæ) in the absence of teeth, in having the sacral diapophyses dilated, and the sternum wholly cartilaginous. Most have a short-limbed, thickset figure and warty skin, and the majority are quite terrestrial or burrowing, but some are aquatic and others arboreal or aberrantly modified. There are seven genera containing 15 species in the family, besides Bufo. Noticeable among these are the common Australian toad (*Myobatrachus Gouldi*), which has a smooth skin; the repulsive egg-shaped, long-tongued, termite-eating Mexican species (*Rhinophrynus dorsalis*); and the large, warty, swimming toads of the East Indian genus Nectophryne.

The common toad of Eastern North America (*Bufo lentiginosus*) is a fair type of the group. It reaches a length of about 3½ inches, and is brownish olive, with a yellowish vertebral line and some brownish spots; but it is exceedingly variable. The skin of young toads is nearly smooth, but that of adults is very warty. It contains many poison glands from which a milky somewhat acrid fluid exudes when the animal is roughly handled. This and the urine are harmless so far as man is concerned, but have a protective value in making the creature distasteful to many predatory animals.

The food of the toad consists of worms, insects, and snails, which must be alive and moving in order to attract its notice. These are seized by the darting out of the tongue (see FROG), which is done so rapidly as to baffle all but very attentive observation. This fare is captured mainly during twilight and at night. The list of known foods embraces every sort of insect and larva that can be captured, including many most injurious to horticulture; and there is no doubt that a reasonable number of toads in a garden gives a valuable assistance in keeping down pests. They do no harm at all. They molt the outer skin several times a year, struggling out of it, and then swallowing it. When cold weather comes on they dig a hole in the ground, or find some warm, dry crevice among rocks, in a cellar or the like, and become dormant. This power of hibernation, and their ability to endure deprivation of food and water, tend to a longevity very unusual in so small an animal, for toads under favorable conditions will live thirty years or more. The stories told of buried toads surviving for long intervals in solid clay, rock, and the like, are usually unworthy of belief. Experiment has shown that no toad can long endure deprivation of air, water, and food, although Buckland found that specimens immured in blocks of porous stone and buried in moist soil remained alive after eighteen months. As soon as the toads emerge in the early spring their melodious piping is heard, and they make their way to water, where fighting between males and the mating of the sexes begin. After a few days long gelatinous ropes of black holoblastic eggs, each about one-fifteenth of an inch in diameter, are to be found coiled or matted in warm ponds and roadside pools. Each female begins to breed when about four years old, and lays six to ten thousand eggs annually. These eggs rapidly increase in size, and hatch in four weeks or less, according to weather. A detailed history by R. Wright of their development may be found in the *Standard Natural History*, vol. iii. (Boston, 1885). The larvæ are considerably advanced when freed from the egg, and are provided with a peculiar temporary organ in place of the yet undeveloped mouth, by which they cling to weeds and similar supports; and with bushy external gills as breathing organs. There is no trace of limbs, but a swimming organ is present in the form of a large fin-bordered tail. Development proceeds rapidly. The true mouth is soon formed, and the tadpoles begin to feed upon the minute algæ coating the bottom and floating on the surface, and later eat animal substances. They are the best scavengers for an aquarium. They keep in shallow water near shore, but are preyed upon by newts, turtles, fishes, and predaceous aquatic insects. Gradually growth advances, the fore legs appear, and later the hind legs are developed and the tail and gill-tufts are gradually absorbed. (For experiments in rearing tadpoles under various food-conditions, see *Factors of Evolution*, under Evolution.) By midsummer the limbs are perfected, lungs have been formed, the tail is reduced to a mere stump, and the tadpoles creep out of the water as small toads. Here they encounter a host of enemies, birds, snakes, turtles, etc., so that a very small proportion escape to develop into adulthood, when they have few enemies except snakes.

The common toad of the Old World (*Bufo vulgaris*) is very similar to the American toad. It inhabits almost the whole Palæarctic region, eastward to China and Japan. India and the Malay Archipelago have a widely prevalent and very rough-skinned species (*Bufo melanostictus*), which has considerable power of changing color. The green toad of the Mediterranean region (*Bufo viridis*) is highly variable in color; and the natterjack and panther toads (qq.v.) of Western Europe much resemble it. The largest member of the genus is the huge agua toad of tropical America. (See Agua.) Various more distantly related amphibians are called 'toads,' as for example 'tree-toads' (see Hyla; Tree-Frog); the South American horned frogs (q.v.) of the cystignathine genus Ceratophrys; the Surinam 'toad' (see Pipa), and others. Compare Frog; Spadefoot.

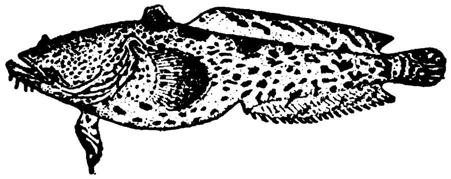
Fossil toads are quite rare, but are found scattered through the Tertiary formations from the Eocene upward, especially in Europe. Some very fine skeletons of toads, and even remains of tadpoles, have been found in the fresh-water Miocene deposits of Germany.

Consult: Cope, *Batrachia of North America* (Smithsonian Institution, Washington, 1889); Boulenger, *Tailless Batrachians of Europe* (Ray Society, London, 1896); Kirkland, "Habits, Food, and Economic Value of the American Toad," in *Bulletin 46, Hatch Experiment Station* (Amherst, Mass., 1897); Gadow, *Amphibia and Reptiles* (London, 1901).

See accompanying Colored Plate.

TOAD BUG. Any of the curious heteropterous insects of the family Galgulidæ. They have a short, broad body, projecting eyes, and dull, mottled colors, suggesting a miniature toad. They live in moist places along the banks of streams and ponds. About twenty species are known, of which three inhabit the United States. Our commonest species is *Galgulus oculatus*.

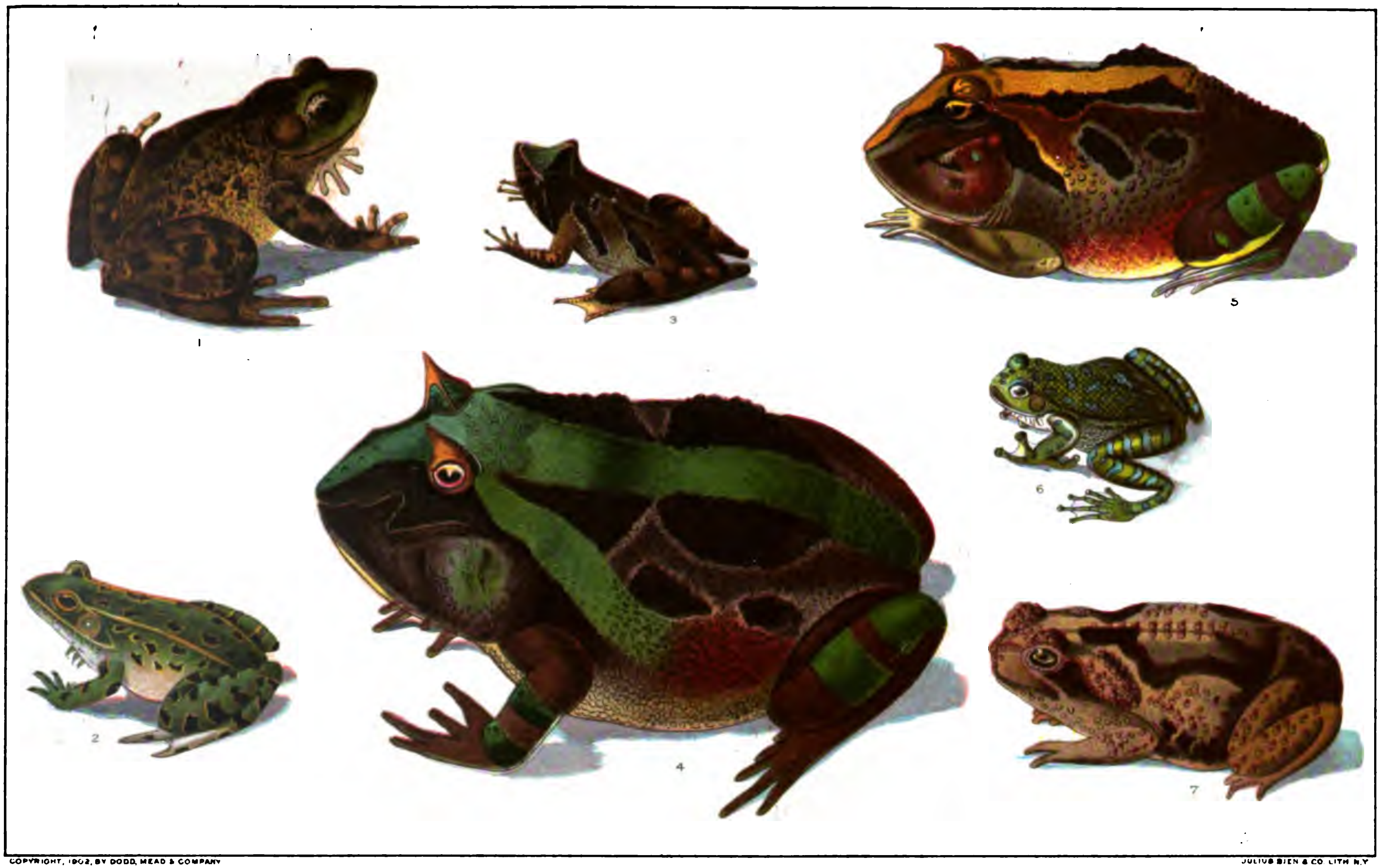
TOADFISH, or Sapo. One of a family (Batrachoididæ) of fishes allied to the gobies, the young of which fasten themselves to rocks by a central disk which is soon lost. They are small carnivorous and scavenging coast fishes of all warm seas, abundant about weedy rocks and coral reefs. They have a robust form, are inactive, and resemble toads in the mingled browns and yellows of their coloration. The species illustrated (*Opsanus pardus*) inhabits the Gulf of Mexico.



A TOADFISH.

TOADFLAX, or Butter-and-Eggs (*Linaria*). A genus of plants of the natural order Scrophulariaceæ, distinguished chiefly by the spur at the base of the corolla and the capsule opening by valves or teeth. The species are herbaceous, natives chiefly of the colder and temperate parts of the Old World. Common toadflax (*Linaria vulgaris*) has an erect stem one to three feet high, with glaucous, linear-lanceolate leaves which thickly cover the stem, and terminal spikes of yellow flowers. It grows in fields along roadsides, etc., in Europe and America, where it has been introduced and where it is usually considered a troublesome weed. A very remarkable mon-

AMERICAN FROGS AND TOADS



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO. LITH. N.Y.

1 BULLFROG - RANA CATESBIANA
2 LEOPARD - FROG - RANA VIRESCENS.
3 CRICKET-FROG - ACRIS GRYLLUS.
4 HORNED FROG (FEMALE) CERATOPHRYS DORSATA
5 HORNED FROG (MALE) CERATOPHRYS DORSATA
6 FLORIDA TREE-FROG - HYLA GRATIOSA.
7 AGUA TOAD - BUFO MARINUS.

strosity called peloria is sometimes seen in this plant, the flower presenting five spurs and five usually imperfect stamens.

TOADFLAX (*Linaria vulgaris*).

TOADSTOOL. A fungus of the group Basidiomycetes (q.v.), whose fructification is usually a stalk bearing a cap. See FUNGI, EDIBLE AND POISONOUS; MUSHROOM.

TOAST (OF. *toste*, from ML. *tosta*, toast, Lat. fem. sing. of p.p. of *torrere*, to dry; connected with Gk. *τερέσθαι*, *teresthai*, to become dry, Skt. *tarṣ*, to thirst, and ultimately with Eng. *thirst*). Originally the name given to bread dried or scorched before the fire. As early as the sixteenth century toast formed a favorite addition to English drinks, especially sack and punch. The application of the word to a lady whose health is drunk, and thence to any sentiment mentioned with honor before drinking, is said to have originated from an incident described in *The Rambler* (No. 24), as having happened at Bath in the eighteenth century, when it was the fashion for ladies to bathe publicly, in elegant dresses made for the purpose. "It happened that on a public day a celebrated beauty of these times was in the Cross Bath, and one of the crowd of her admirers took a glass of the water in which the fair one stood, and drank her health to the company. There was in the place a gay fellow, half fuddled, who offered to jump in, and swore, "though he liked not the liquor, he would have the toast" (meaning the lady). In the later sense, the word has been adopted both in French and German.

TOBA, tō'bȧ (opposite, so called by the Guarani, as living on the opposite or western bank of the Paraguay). A powerful and savage people of Guaycuran stock, the most important tribe of the Chaco region of Northern Argentina. They rove along the Pilcomayo and Vermejo rivers. Their language is a dialect of that formerly spoken by the Abipone (q.v.), whom they exterminated about a century ago. They hunt and fight on horseback with the lance and bow, and are warlike and untamably hostile to all whites who attempt to enter the region.

TOBACCO (Sp. *tabacco*, *tabaco*, from the Carib name, of uncertain meaning; perhaps the name of the pipe smoked by the Indians, or of the tubes into which the leaves are rolled for smoking, or the Haitian name of the plant, or the old name of the island now called *Tobago*, near Trinidad, or the name of a province *Tobaco*, said to be in Yucatan), *Nicotiana tabacum*. A plant of the natural order Solanaceæ. It has broad leaves, terminal panicles of flowers, and two-celled, five-valved fruits (many-seeded capsules). The numerous varieties differ more or less in the size and form of the leaves, and in the form and color of the flowers. Its generic name is in honor of Jean Nicot, who introduced it into France. Whether the use of tobacco as a narcotic was known in the East before the discovery of America is somewhat doubtful. Probably the habit had been long practiced in China, but it is not certain. If it was so, the custom did not extend among neighboring nations, whereas, on the introduction of the use of tobacco from America, where the Indians have smoked the leaves since remote antiquity, it rapidly extended throughout Europe, and soon became extensively prevalent among Oriental nations. The Indians used it in their important transactions. Thus the calumet (q.v.), or pipe of peace, is indispensable to the ratification of a treaty; and smoking together has even greater significance of friendship than eating together has among the nations. Tobacco seed was first taken to Europe by Gonzalo Fernandez de Oviedo, who introduced it into Spain, where it was first cultivated as an ornamental plant, till Nicolo Manardes extolled it as possessed of medicinal virtues. It was introduced into Italy in 1560. Its use as snuff soon followed its introduction for smoking. There is no reference to the use of tobacco in Shakespeare, yet it is certain from other evidences that it then was well known in England, although, on account of its high price, its use was

TOBACCO (*Nicotiana tabacum*).

confined to the wealthy. It was smoked in very small pipes and the smoke was expelled, not from the mouth, but through the nostrils. Tobacco was at first recommended for medicinal virtues, but soon became an article of luxury. The Popes Urban VIII. and Innocent XI. fulminated against it the thunders of the Church; the Sultans of Turkey declared smoking a crime, Sultan Amurath IV. decreeing its punishment by the most cruel kinds of death; and King James I. of England issued a *Counterblaste to Tobacco,* in which he described its use as "a custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs, and in the black, stinking fumes thereof nearest resembling the horrible Stygian smoke of the pit that is bottomless." Although the habit did not become prevalent in the East till the seventeenth century, the Turks and Persians are now the greatest smokers in the world. In India all classes and both sexes smoke; in China the practice is universal.

In America the culture of tobacco began in Virginia with the earliest settlement of the colony. It is recorded that in 1615 the gardens, fields, and even the streets of Jamestown were planted with tobacco, which immediately became, not only the staple crop, but the principal currency of the colony. In 1619 "ninety agreeable persons, young and incorrupt," and in 1621 "sixty more maids, of virtuous education, young and handsome," were sent out from London on a marriage speculation. The first lot of these ladies was bought by the colonists for 120 pounds of tobacco each; the second lot brought 150 pounds each. The culture of tobacco was introduced into the Dutch colony of New York in 1646, though it never gained the same prominence there as farther south. Maryland, the Carolinas, Georgia, and later Kentucky, made it the leading crop almost from their first settlement. It long constituted the most valuable export of the colonies. From 1744 to 1776 the exports of the crop averaged 40,000,000 pounds a year. None of the cotton States now produce much tobacco, but one county in Florida, Gadsden, has long been celebrated for the production of Cuban tobacco, which always brings a high price. As a commercial crop tobacco is confined to rather limited areas in a few States. In the production of wrapper leaf for cigars Florida and Connecticut take the lead. Pennsylvania and Wisconsin produce a great deal of filler leaf for cigars. Other classes of tobacco are grown extensively in Kentucky, Virginia, North Carolina, Maryland, Ohio, Indiana, and Missouri in the order named.

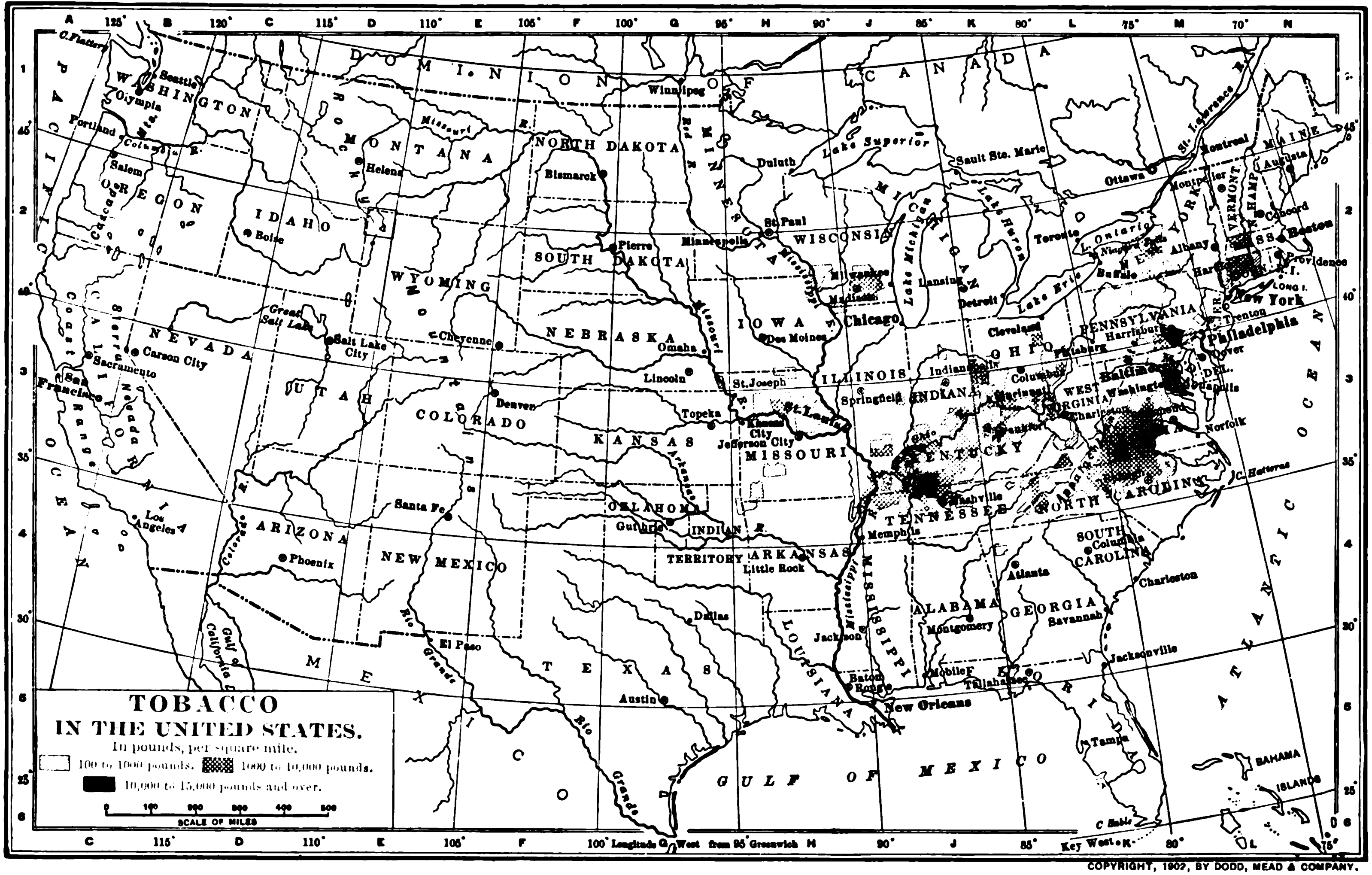
The United States produces more tobacco than any other country in the world, and exports more than one-third of the product, chiefly to Germany, England, France, Italy, Austria, and Holland, in the order named. The value of the tobacco exported in 1850 was $6,417,251, in 1899 $25,467,218. The amount received by the United States Government from the internal revenue tax on tobacco products is a large one. In 1890 it amounted to $33,949,997. The value of tobacco imported in 1899 was $9,900,253, at an average price per pound of 70.2 cents.

The product of tobacco in Europe is nearly equal to the average production of the United States. Austria-Hungary produces about one-third of it, Russia one-tenth, Germany nearly as much, France about 35,000,000 pounds, and the other countries a small quantity. Europe can easily produce all the tobacco required, but American tobacco is largely imported, because it is cheap and is considered valuable for mixing with and fortifying European leaf.

In America tobacco is divided commercially into four classes: (1) cigar; (2) cigarette; (3) manufacturing (chewing, smoking, and snuff); (4) export.

CULTIVATION. The variety of tobacco planted depends upon soil, climate, and market demands. The different types of tobacco are grown upon a wide range of soils differing mainly in their physical characters. Wet soils composed largely of clay produce large heavy plants that cure to a dark brown or red. Light sandy soils produce plants having a light thin leaf curing to a bright red, mahogany, or fine yellow. The influence of soil, climate, and manures on the quality of the produce is almost beyond what is known in any other cultivated plant. In the more northern regions the seed is sown in a hot-bed and protected from frost by cheese cloth. The young plants are very tender and require frequent watering with weak liquid manure. They will be ready for transplanting in five or six weeks. For cigar tobacco the plants are grown rather close, 14 inches in Florida giving leaves of desirable size, quality, and appearance. For manufacturing tobacco the distance should be greater. Cultivation should be frequent and shallow and should cease when the plants begin to button. Where the production of seed is not desired the plants are topped to prevent flowering, that their whole strength may be directed to the leaves except in the case of that grown for cigar wrappers when a thin leaf is the more valued. Fertilizers affect the quality of tobacco more than the yield. Barnyard manure produces a rank growth but poor quality. Potash is the most important element to be supplied in growing tobacco, and the best forms are the carbonate and the sulphate. Nitrogen is best supplied in cottonseed meal, bone meal, and dried blood.

When the leaves begin to turn yellow the plants are ready to harvest. This is usually done by cutting down the stalk near the ground. In the better grades of cigar tobacco the leaves are primed off, beginning with the lower as they ripen, a process requiring more labor, but giving a more uniform and valuable product. The time generally chosen for cutting is in mid-day, or when the sun is powerful. The cutting is done by hand, and only such plants are chosen as are ready. If the plants are very large, the stalk is often split down, to facilitate the drying. They are then removed from the field to the tobacco-house, around which are erected light scaffolds, from which the plants are suspended without touching each other. After drying the leaves are removed from the stalks and tied up in bundles called hands. The losses in curing are about 85 per cent. of weight at cutting. After curing tobacco goes through the process of fermentation or ageing. This consists primarily of a reduction in the per cent. of nicotine and the development of aroma. The action is caused by unorganized ferments or enzymes inherent in the leaf and may extend through a period of a few weeks or of two years, depending upon the method of handling. In the slow fermentation the tobacco is packed in cases and stored in ware-



TOBACCO

IN THE UNITED STATES.

In pounds, per square mile.

□ 100 to 1000 pounds. ▨ 1000 to 10,000 pounds.

■ 10,000 to 15,000 pounds and over.

COPYRIGHT, 1902, BY DODD, MEAD & COMPANY.

houses. In a quicker and better method, as practiced in Cuba and the cigar districts of the United States, the tobacco is piled under suitable conditions of moisture and the process of fermenting is hastened by the heat developed. The tobacco is repiled when the temperature rises to a certain point, and so continued until the proper flavor and aroma are developed. Tobacco for cigarettes is cured by heating it for a short time in large ovens. The product is of light color and a small nicotine content and without the agreeable aroma of cigar tobacco.

Tobacco, owing to the high rate of duty when in any manufactured form, is mostly imported in the leaf; but small quantities are brought in, chiefly for reëxport, in various states of manufacture.

Tobacco Diseases. Among the various diseases of tobacco perhaps the best known is calico or mottled top, a Connecticut name for the mosaic disease of Holland. The 'spotting' of tobacco in Connecticut, the spot disease of Russia, and the *nielle* of France are somewhat similar. The mosaic disease as described by Mayer, one of the first to investigate it in Holland, is characterized by mottled light and dark green leaves a few weeks after the plants are set. The tissue in the darker parts of the leaves grows faster and soon is much thicker than the light-colored areas. As the disease progresses some of the thin areas die out, giving a decidedly mottled appearance to the leaf. The diseased plants are usually irregularly distributed throughout the field. The cause has been the subject of much controversy. By many observers it is said to be of bacterial origin. Others claim it to be due to certain enzymes which disturb the balance between the normal functions of certain cells. Beijerinck claims to have produced the disease by inoculating healthy plants with the sterilized fluid from diseased leaves. Others claim it to be due to soil and water conditions. The evidence now at hand seems to favor the theory of the unorganized ferments as the probable cause. The spot disease is characterized by white or brown spots of various size and shape upon the leaves. In some cases the leaves resemble the spotted condition which is considered so desirable in some tobaccos, as the Sumatra wrapper leaf. The cause of the spot is not definitely known. In Australia the fungus *Peronospora hyoscyami* produces a common and destructive disease of the plants, and in Java and Sumatra the dark spots are attributed to *Phytophthora nicotianæ*. Both these diseases may be prevented by thorough application of Bordeaux mixture. In the curing of tobacco two diseases, pole burn and stem rot, are common. Pole burn is likely to develop if long continued damp, sultry weather occurs while the plants are being cured. It first attacks the veins, turning them black, but spreads to the rest of the leaf, blackening it and making it very bitter. Certain fungi seem always present in this disease, as well as many bacteria. It is believed the fungi are the principal cause of the injury, in which the bacteria doubtless assist. This disease may be prevented by artificial heat and ventilation. The stem rot is due to the fungus *Botrytis longibrachiata*. It attacks the stems and veins, producing patches of velvety white fungus and causing more or less decay. The spores ripen upon the stalks that are thrown aside as worthless. These should be carefully collected and burned, and the tobacco barn thoroughly fumigated with sulphur fumes before and after curing a crop.

Cigars and Cheroots are forms of manufactured tobacco. Cuba supplies the best cigar tobacco, the best cigars being made from that grown in Vuelta Abajo and hence known as Vuelta tobacco. The greater proportion of genuine Havana cigars smoked in this country are not manufactured in Cuba, but in Florida by Cuban workmen from genuine imported tobacco, under the system used in Cuba and known to the trade as 'Cuban hand-work.' This term characterizes a very careful method, by which each piece of leaf is so graded that the entire cigar is of the same color throughout, with each vein of the leaf running in the same direction, in order to insure even and perfect burning.

Next to Cuban ranks the tobacco grown in Florida, while the product of Borneo, Ceylon, and the Philippine Islands is considered little inferior. Persia also produces a good article. Turkish tobacco is very aromatic. The name Turkish is loosely applied to the leaf grown in Syria, Rumelia, Karamania, and about the Persian Gulf. A light yellow tobacco is smoked in China, and some of it is exported. Very excellent tobacco is grown in Java and Sumatra and shipped to Amsterdam, where the best cigars in Europe are most readily obtained. Burmese tobacco is fair. In Germany inferior tobacco is produced along the Rhine, near Baden and at Mainz, and is used for home consumption. In France tobacco is a Government monopoly and can be grown only by those who receive a special license. These producers have the choice of selling their tobacco to the Government manufacturers or of exporting it. The best cigars made in Europe of European tobacco are those manufactured in Spain.

Cigarettes. Of late years cigarette smoking has increased greatly, but in the United States the increased manufacture of little cigars has caused an apparent decrease in the number of cigarettes made. Under the classification in the revenue returns, it is difficult to secure satisfactory statistics. The manufacture is now practically in the hands of a single 'trust.' In France there are several factories exclusively devoted to the production of cigarettes, employing over 2000 women and turning out more than 400,000,000 cigarettes a year. In Spain the consumption of cigarettes is very great, but the practice is for the smoker to roll his own, rather than to smoke the manufactured article.

Snuff was originally made in Spain, and later in England, Scotland, Holland, and Belgium. It was at first made by grinding the leaf tobacco in mortars, and scenting the powder in various ways. It is now ground in metal mills by steam power. The United States produces a small amount of snuff, but the practice of taking snuff is annually declining. In the reports of the manufactures of tobacco, snuff is classed with chewing tobacco. Chewing tobacco is put up in pressed cakes called 'plug tobacco,' and in a spongy mass of fine threads known as 'fine cut.' Usually flavoring matters, as vanilla, sugar, syrups, glycerin, etc., are added in small amounts. Different manufacturers have various formulas, considered as trade secrets, for improving their products. Smoking tobacco for pipes is put up or molded in the form of human or animal heads, as in the European characteristic or grotesque pipes, especially those of Holland and Germany. The opium pipe of China is a special development with a large cylindrical bowl having a small aperture, and a large flute-shaped stem designed for the inhalation of a small quantity of fumes from a pellet of burning opium. The hemp pipe of India is a form of water pipe in which tobacco or a mixture of tobacco and hemp may be smoked. The Chinese and Japanese prefer a pipe with a very small bowl in which a pellet of finely shredded tobacco is smoked. The Koreans use a larger bowl with an extremely long stem. In Africa the water pipe is rudely made of a cow's horn perforated for stem and bowl holder. It is said that a Kafir lacking a pipe will often dig a small hole in the ground in which he puts tobacco, fit a stem in position below it, and, lying on his belly, enjoy a smoke. Consult: Nadaillac, *Les pipes et le tabac* (Paris, 1885); McGuire, *Pipes and Smoking Customs of the American Aborigines* (Washington, 1897).

TOBA'GO or **TABAGO.** An island of the British West Indies, belonging to the colony of Trinidad, and situated 22 miles northeast of the island of that name (Map: West Indies, R 9). Area, 114 square miles. It is of volcanic origin and is mountainous, with peaks rising about 2000 feet above the sea. The climate is warm, and the rainfall on the windward side amounts to 66 inches. Sugar and coffee have been the staple products, but cotton, tobacco, and cacao are now receiving more attention, and a large number of rubber trees have been planted. The volume of trade amounts to about $150,000 annually. Population, in 1901, 18,750, chiefly negroes. The chief town, Scarborough, has about 1000 inhabitants. The island was discovered by Columbus in 1498, and became a British possession in 1763.

TOBERENTZ, tō'be-rĕnts, ROBERT (1849—). A German sculptor, born in Berlin, where he frequented the Academy in 1867-69. He then studied under Schilling in Dresden and from 1872 to 1875 in Rome. After his return to Berlin he became a follower of Begas, in whose manner he executed, among other works, the bronze figure of a "Shepherd Resting" (1878, National Gallery). In 1879 he was appointed director of a master studio for sculptors connected with the Breslau Museum, resigned in 1884, and after living in America in 1885-89, returned to Berlin in 1890 and became professor in 1895. He completed the "Luther Monument" of Paul Otto, in Berlin, modeled the equestrian statue of Frederick Barbarossa for the Kaiserhaus at Goslar, and made the statue of Frederick the Great for the Royal Palace in Berlin. He also fashioned several masterly life-size nude figures, such as an "Ancient Greek Maiden Sculptor" and "Girl Asleep on a Couch."

TO'BIT, BOOK OF (Gk. *Τωβειτ*, *Tōbeit*, *Τωβειθ*, *Tōbeith*, from Heb. *Tōbīyāh*, Yahweh is good). One of the books of the Old Testament Apocrypha. The Catholic Church regards it as in the canon and historical. The personage around whom the story of the book centres is Tobit of the tribe of Naphtali, who was carried away to Assyria by Shalmaneser. Here he obtains an official position with the King, but loses it under Sennacherib, and because he has buried certain Jews killed by order of the King, he flees from Nineveh. His nephew, Achiacharus, pleads with the successor of Sennacherib, and under Esarhaddon Tobit returns to Nineveh. Again he buries the dead, and while in an 'unclean' condition he sleeps outside the wall of his courtyard and loses his eyesight. In his misfortune he is supported by his nephew Achiacharus, but, taunted by his wife, Anna, he sends his son Tobias to collect an outstanding debt in Ragæ in Media. Tobias takes with him as guide one Azarias (in reality Raphael, the angel). On the way Tobias is attacked by a fish, whose heart, liver, and gall he takes at the command of Raphael. They come to the house of Raguel, a kinsman of his, and Tobias marries Sarah, the only daughter of Raguel. By burning the heart and liver of the fish in the bridal chamber the evil spirit, Asmodeus (q.v.), who has already killed seven husbands of Sarah, is driven away. The debt collected, the three return to Nineveh, and Tobias applies the gall of the fish to his father's eyes and their sight is restored. Tobit dies at Nineveh and is buried there; Tobias dies at Ecbatana, yet not before he has heard of the destruction of Nineveh by Nebuchadnezzar. The date of the composition of the book is variously given as the fourth century B.C. (Ewald), third century (Reuss), and second century (Schürer, Nöldeke). The last is probably correct. The story is a pure romance, and the vividness of the descriptions is but a proof of the artistic ability of the writer. The book exists at present in Greek, Latin, Syriac, Aramaic, and Hebrew manuscripts, the texts of which differ considerably. The oldest and most valuable text is that contained in the Alexandrine codex of the Septuagint and probably represents the original text. The Hebrew versions, of which there are three, are late and based on the Greek text. The purpose of the book is to emphasize God's Providence toward pious Jews who remain faithful to their religion with all its ceremonial obligations. Consult: Kautsch, *Apokryphen* (Tübingen, 1900); Wace, *Apocrypha* (London, 1888); Neubauer, *The Book of Tobit* (Oxford, 1878); and for the text, Nestle, *Septuaginta-Studien* (Leipzig, 1899).

TOBLER, tō'blĕr, ADOLF (1835—). A Swiss Romance philologist, born at Hirzel, in the Canton of Zurich, and educated in the schools of that town and at the University of Bonn. In 1867 he became professor at the University of Berlin. His monographs on philological subjects are many, and his researches have contributed greatly to the knowledge of Old French syntax. His publications include: *Gedichte von Jehan de Coudet* (1860); *Mitteilungen aus altfranzösischen Handschriften* (1870); *Li dis don vrai aniel* (1871 and 1884); *Vom französischen Versbau alter und neuer Zeit* (3d ed., 1894; French translation, 1885); *Das Buch der Uguçon des Laodho* (1884); *Das Spruchgedicht des Girard Pateg* (1886); *Vermischte Beiträge zur französischen Grammatik* (three series, 1886-94); an edition of *Li proverbe au vilain* (1895).

TOBLER, TITUS (1806-77). A Swiss Oriental scholar. He was born at Stein, Canton of Appenzell, studied and practiced medicine, traveled in Palestine, and after taking part in the political affairs of Switzerland, settled in 1871 at Munich. His principal work is *Topographie von Jerusalem und seinen Umgebungen* (1853-54), which was supplemented by *Beitrag zur medizinischen Topographie von Jerusalem* (1855); *Planographie von Jerusalem* (1858); *Dritte Wanderung nach Palästina* (1859); *Bibliographia Geographica Palestinæ* (1867). Consult his *Life* by Heim (Zurich, 1879).

TOBOGGAN (North American Indian *otobanask, odabagan,* sled). A vehicle used for coasting, which differs from the ordinary coasting sled in that it has no runners beneath its flat surface. It seems to have been improvised by the Indian hunters, who used it to bring in their dead game over the snow. With them it was simply a strip of bark turned up at the front to facilitate its passage over rough ground and braced by strips or pieces of wood running both crosswise and along the edges. Among the Eskimos it was made from strips of whalebone. It is of the same primitive pattern to-day, except that in some cases a light rail runs along its sides. For sporting purposes it is usually made of thin strips of ash, maple, or hickory, slightly oval on the bearing surface, placed side by side and fastened at the ends, the under surface being highly polished. The ordinary toboggan is about 18 inches wide and 6 to 8 feet long. The usual number of occupants is four. One sits in front with his feet under the hood, two in the centre, and the steersman at the back. The latter sits crouching, one leg bent, the other stretched behind him to be used as a rudder, for which purpose his moccasin has a hard leather steering-tip. In some cities, especially Montreal, chutes are constructed for this sport. Great speed is attained on them; a distance of 900 yards has been traveled in 30 seconds. See Coasting.

TOBOLSK′, *Russ. pron.* tô-bôl′y'sk. A government of Western Siberia, bounded by the Arctic Ocean on the north, the governments of Tomsk and Yeniseisk on the east, the territories of Akmolinsk and Semipalatinsk on the south, and European Russia on the west (Map: Asia, G 2). Area, estimated at 539,659 square miles. The surface is flat with the exception of the northwestern part, which is covered with offshoots of the Ural Mountains, attaining an altitude of over 4000 feet. The larger part of the north belongs to the region of polar tundras and is practically uninhabited. The southern part is somewhat undulating and consists to a large extent of vast steppes, well watered and with a rich black soil which makes that part of the government one of the richest agricultural regions in the Empire. The chief waterway is the Obi (q.v.), which, with its great tributary, the Irtysh (q.v.), drains almost the entire region. Lakes are very numerous and some of them are salty. The climate is continental and severe, the average annual temperature varying from 24° at Berezov (q.v.) in the north to about 32° at Tobolsk in the south. The immigration into Tobolsk has latterly been very strong, and some parts in the south are as densely populated as any rural part of European Russia. The agricultural holdings are comparatively large, and considerable quantities of grain are exported. Wheat and rye are the principal products. Dairying is a growing industry and the export of butter exceeds $1,500,000 per annum. The manufactures are chiefly paper, cloth, spirits, leather, and glassware. Of the population of 1,438,484 in 1897, the non-Russian element numbered only about 90,000, composed chiefly of Tatars, Ostiaks, Samoyeds, and Voguls.

TOBOLSK. The capital of the government of the same name in Western Siberia, situated on the Irtysh at its junction with the Tobol and 172 miles north of Tiumen, the terminal of the North Siberian Railway (Map: Asia, F 3). It is well built and has a picturesque appearance with its Kremlin and numerous churches. Its importance has greatly diminished since the construction of the Trans-Siberian Railway. Its chief industries are fishing and fur-making. Tobolsk was founded in 1587 and is one of the oldest Russian settlements in Siberia. Population, in 1897, 20,427.

TOBY. The name of Punch's dog, in the Punch and Judy shows.

TOBY, Uncle. A leading character in Sterne's *Tristram Shandy.* He is a retired sea-captain, simple, kindly, and gallant, said to have been modeled on Sterne's father.

TOCANTINS, tō′kȧn-tēns′, *Pg. pron.* tō′käɴ-tēɴsh′, Rio. A large river of Brazil, often considered as a branch of the Amazon (Map: Brazil, H 4). It rises in the southern part of the State of Goyaz, and flows northward, emptying into the Atlantic Ocean through the large estuary known as the Rio Pará (q.v.), which communicates with the estuary of the Amazon. The total length of the Tocantins is about 1700 miles. About 600 miles from its mouth it receives the Araguayá (q.v.), which flows nearly parallel with, and exceeds in length, the main river from the point of confluence. The Tocantins is obstructed in several places by rocky reefs formed by spurs of the cordillera which it skirts. The last of these, the Falls of Itaboca, are situated below the confluence of the Araguayá, only 130 miles above the estuary, and completely obstruct navigation. Small steamers, however, ply on the upper reaches, though the country along the banks is very sparsely populated and almost undeveloped.

TOCCATA, tô-kä′tȧ (It., touched). In music, a term originally applied to compositions written for keyed instruments, thus having a somewhat more restricted meaning than sonata, a composition for any instrument. The oldest toccatas preserved are some written for the organ by Claudio Merulo (published 1598). They generally begin with full chords which gradually give way to passage-work among which small fugato sections are interspersed. The modern toccato does not materially differ from that of Merulo. Compare Sonata.

TOCHER, tŏ′ɢẽr (Ir. *tochar,* Gael. *tochradh,* dowry, portion). In the Scotch law, an ancient name for money or property given or settled by a father on his daughter at her marriage.

TOCHIGI, tō′chē-gē. A town in the Prefecture of Tochigi in Central Hondo, Japan, 55 miles by rail north of Tokio (Map: Japan, F 5). It is of some industrial importance and had in 1898 a population of 22,379.

TO′CORO′RO. A Cuban trogon (*Priotelus temnurus*) named from its cry. It breeds in holes abandoned by woodpeckers, and is remarkable for the concave outline of the end of its short tail.

TOCQUEVILLE, tôk'vêl', Alexis Charles Henri Clérel de (1805-59). A French statesman and political philosopher, born at Verneuil, in the Department of Seine-et-Oise. At the Restoration his father was made a peer of France. His mother was a granddaughter of Malesherbes, the academician, political writer, and magistrate, who defended Louis XVI. at the bar of the Convention. Alexis de Tocqueville studied law, was admitted to the bar in 1825, traveled in Italy, and on his return became an assistant magistrate at Versailles. In 1831 he gave up his appointment at Versailles, and with his colleague there, Gustave de Beaumont, accepted a Government mission to America, to study the working of the penitentiary system. The commissioners, after their return to Europe, published their report (*Du système pénitentiaire aux Etats-Unis*, 1832; Eng. trans., Philadelphia, 1833)—an admirable work, which modified all the ideas previously entertained in France regarding prison discipline. But this was not the most important result of their inquiries. In 1835 De Tocqueville published his great work, *De la démocratie en Amérique.* In his introduction he sought to show that a great democratic revolution had for centuries been going on in Europe. There is a general progress toward social equality, which must be looked on as a providential fact. In France it has always been borne on by chance, the intelligent and moral classes of the nation never having connected themselves with it, in order to guide it. In America he found that the same revolution had been going on more rapidly than in Europe, and had indeed nearly reached its limit in the absolute equality of conditions. There, accordingly, he thinks we may see what is about to happen in Europe. He points out that the people in America may be strictly said to govern. They make the laws and administer them. He draws from what he has observed the conclusion that democracy may be reconciled with respect for property, deference for rights, safety to freedom, and reverence for religion. The work made a profound impression. Its author was elected to the Academy of Moral Science in 1836 and to the French Academy in 1841.

In 1835 De Tocqueville visited England, where he received an enthusiastic welcome from the leaders of the Whig Party. In the same year he married Miss Mary Mottley, an Englishwoman. In 1837 he was defeated as a candidate for the Chamber of Deputies from Valognes, but two years after he was elected by an overwhelming majority, and ranged himself with the Moderate Opposition Party. After the February Revolution he was a formidable opponent of the Socialists and extreme Republicans, as well as of the partisans of Louis Napoleon. He became, in 1849, vice-president of the Legislative Assembly, and from June to October in the same year was Minister of Foreign Affairs. During that time he defended the policy of the expedition to Rome, on the ground that it would secure liberal institutions to the States of the Church. After the coup d'état of December, 1851, he retired to Tocqueville, where he devoted himself to agricultural pursuits. In 1856 appeared his second great work, *L'ancien régime et la révolution.* In June, 1858, he took up his abode at Cannes, where he died. De Tocqueville's *Œuvres et correspondance inédites* were published (1860), by his friend De Beaumont, who prefixed a biographical notice. His *Mémoires* are a valuable contribution to the history of the Revolution of 1848 and the coup d'état. An English translation, *The Recollections of Alexis de Tocqueville,* was published in New York in 1896.

TOCUYO, tô-kōō'yô. A town of the State of Lara, Venezuela, 180 miles southwest of Carácas, on the Tocuyo River (Map: Venezuela, D 2). The valley of this river is one of the richest agricultural and grazing districts of the Republic, producing in abundance sugar-cane, wheat, coffee, and cacao. Besides exporting these products Tocuyo has wool and leather manufactures, salt works, and household weaving. Tocuyo was founded in 1535. Population, about 15,000.

TODAS, tō'dȧs. A people of the Nilgiri Hills in Southern Hindustan, who have been the subject of much discussion by ethnologists. The majority of the authorities consider them to be of Dravidian stock. The Todas are tall, well-built, dolichocephalic, with prominent nose, features approaching the Caucasian, full beard, black hair, and rather light brown skin. Consult Marshall, *A Phrenologist Among the Todas* (London, 1873).

TODD, Charles Burr (1849—). An American author, born at Redding, Conn. He was prevented by poor eyesight from entering college, and became a journalist and historical student. In 1877 he was appointed commissioner for the erection of a suitable memorial on the site of the winter quarters of Gen. Israel Putnam's division of Continentals in Redding, Conn. In 1895 he was secretary of the committee appointed by Mayor Strong for the printing of early records of New York City. His publications include: *History of Burr Family* (1879); *Life and Letters of Joel Barlow* (1886); *The Story of the City of New York* (1888); and other works.

TODD, David Peck (1855—). An American astronomer, born at Lake Ridge, N. Y., and educated at Amherst College. He was chief assistant to the United States Transit of Venus Commission in 1875, and his reductions of the observations were the first derived from the American photographs. He took charge of the Lick Observatory observations of the transit of Venus in 1882. In 1887 he conducted the American Eclipse Expedition to Japan and there organized a subsidiary expedition to the summit of Fujiyama for meteorological observations. He returned to Japan in 1896 as head of the Amherst Eclipse Expedition. His publications include: *A Continuation of De Damoiseau's Tables of the Satellites of Jupiter to the Year 1900* (1876; also extended back to 1665), used by American and foreign nautical almanacs; *A New Astronomy* (1897); and *Stars and Telescopes* (1899).

TODD, John (1800-73). A Congregational minister. He was born at Rutland, Vt.; graduated at Yale College in 1822, and at Andover Theological Seminary in 1826. He was pastor at Groton, Mass., in 1827-31; Northampton, 1833-36; Philadelphia, 1836-42; Pittsfield, Mass., 1842-72. He was one of the founders of Mount Holyoke Female Seminary. He had a vigorous and original mind, much practical shrewdness and wit, and fine descriptive power. Some of his works had immense circulation, especially *The Student's Manual* (1835; 20th ed. 1853). He wrote many books for children and young people. His complete works appeared in London (new ed. 1882, 6 parts). Consult *Autobiography* (New York, 1876).

TODD, Robert Bentley (1809-60). An Irish physician, born in Dublin, and educated there at Trinity College. In London he lectured on anatomy for a short time at the Aldersgate Street School of Medicine and then went up to Oxford. About this time he projected the *Cyclopædia of Anatomy and Physiology*—a work which did much to advance the study of comparative and microscopic anatomy. The first number was published in 1835 and the entire work was completed in 1859. He was appointed professor of physiology and general and morbid anatomy at King's College, London, in 1836. In 1849 he gave the Lumleian lectures, and in 1853 he resigned his professorship in King's College. He was known for his pioneer work in the treatment of fevers and inflammations. His publications include: *Gulstonian Lectures on the Physiology of the Stomach* (1839); *Practical Remarks on Gout, Rheumatic Fever, and Chronic Rheumatism of the Joints* (1843); *Description and Physiological Anatomy of the Brain, Spinal Cord, and Ganglions* (1845); *Lumleian Lectures on the Pathology and Treatment of Delirium and Coma* (1850); and *Clinical Lectures* (3 vols. 1854-59, and 1 vol. 1861).

TODDY-CAT. See Palm Civet.

TOD'HUNTER, Isaac (1820-84). An English mathematician. He was educated at University College, London, and at Saint John's College, Cambridge. He was elected Fellow of Saint John's in 1845, and the rest of his life was devoted to mathematical writing and teaching, and to the study of philosophy and of languages. He was a fellow of the Royal Society (1862). Todhunter's text-books were the most popular ones ever published in England. They include, besides a number of elementary text-books: *Differential and Integral Calculus* (1852); *Analytical Statics* (1853); *Analytical Geometry of Three Dimensions* (1858); *History of the Progress of the Calculus of Variations During the Nineteenth Century* (1861); *History of Probability* (1865); *History of the Mathematical Theories of Attraction* (1873); *Researches on the Calculus of Variations* (1871); *Treatise of Laplace's, Lamé's, and Bessel's Functions* (1875); *History of the Theory of Elasticity* (posthumous, 1886). Consult: *Proceedings of the London Mathematical Society* (1884, p. 284, with list of writings); *Proceedings of the Royal Society* (1884, xxvii.).

TODHUNTER, John (1839—). A British poet, born in Dublin, Ireland. He graduated in medicine at Trinity College, Dublin, in 1866, and continued his medical studies in Vienna and Paris. After practicing his profession for a time in Dublin, he became professor of English literature in Alexandra College, Dublin (1870-74). He traveled in the East and settled in London. His lyrical poems comprise: *Laurella and Other Poems* (1876); *Forest Songs* (1881); *The Banshee and Other Poems* (1888); and *Three Irish Bardic Tales* (1896). His dramas include: *Alcestis* (1879); *Rienzi* (1881); *Helena in Troas* (1885); *A Sicilian Idyll* (1890); *The Poison Flower* (1891); *The Black Cat* (performed in 1893). His prose comprises: *The Theory of the Beautiful* (1872); *A Study of Shelley* (1880); and *A Life of Patrick Sarsfield* (1895).

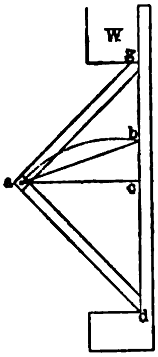
TODI, tŏ'dė. A town in the Province of Perugia, Italy, situated on an abrupt hill near the Tiber, 23 miles south of Perugia (Map: Italy, G 5). Its Etruscan origin is shown in its dilapidated walls and numerous tombs. Its fine remains of the Roman period include a temple or basilica, a theatre, and an amphitheatre. The Romanesque cathedral has a huge tower and frescoes by Lo Spagna. The Renaissance Church of Santa Maria della Consolazione, a massive structure surmounted by three domes, is simple but wonderfully impressive. The splendid Gothic Palazzo Comunale contains a small picture gallery. Todi, the Umbrian Tuder, was the scene of the decisive victory of Narses over the Goths in 552. Population (commune), in 1901, 16,561.

TOD'MORDEN, *locally* tạ'môr-den. A market-town in Lancashire, England, on the border of Yorkshire, 6 miles north-northeast of Rochdale (Map: England, D 3). Cotton manufactures form the staple industry; coal abounds in the neighborhood, and there are foundries and machine works. It owns gas and water-works, maintains a public library, and supports technical instruction. Population, in 1901, 25,420.

TODY (from Lat. *todus*, sort of small bird). Any of several species of small West Indian birds forming the family Todidæ, and related to the kingfishers, bee-eaters, and motmots (qq.v.). They are less than three inches long with a short tail and long bill. The plumage is very gorgeous, grass-green, carmine-red, and white. They breed in holes in banks and lay white eggs. The best known species is the common green tody (*Todus viridis*) of Jamaica, which is a familiar and useful little bird, often called 'robin redbreast' by the English residents. The name 'tody' is incorrectly applied to rollers, barbets, and other brilliantly colored tropical birds, even in the East Indies. See Plate of Wrens, Warblers, etc.

TOGA (Lat., mantle). The principal outer garment of the Roman citizen, worn over a shirt (*tunica*). For ordinary citizens the toga was pure white in color (*toga virilis, toga pura*); boys, and most of the magistrates, wore togas with an attached border of crimson (*toga prætexta*). On certain occasions of especial festivity magistrates appeared in a toga entirely of crimson embroidered with gold (*toga picta*), worn over a tunica of similar character (*tunica palmata*). Candidates for public office presented themselves in togas freshly laundered and artificially whitened (*candida*, shining). On the other hand, persons in mourning for any reason wore carelessly arranged and soiled togas (*sordida*), or even those of an artificially darkened color (*pulla*). The material of the toga was wool, closely woven, and fulled, with a combed nap, making it (at least in late Republican and early Imperial days) cumbrous, expensive, and (except in winter) too heavy a garment. The shape of the toga, like its size, the elaboration of its folds, and the way it was worn, differed at different periods. It was less voluminous in earlier days. By the beginning of the Empire it must have been fully twice as long as the wearer was tall, and of an elliptical shape. It was folded lengthwise and hung over the left shoulder (with the fold toward the neck) so that the end rested a few inches upon the floor in front. The rest of the garment was passed around the back, under the right arm, and thrown backward over the left shoulder, so that the end hung down behind, but cleared the ground. The folds were most carefully and systematically arranged (in later days, more or less, pins or clasps were used), and the end that depended in front was pulled up to clear the floor, and the slack (*nodus, umbo*) allowed to hang down over the mass of folds (*sinus*) that crossed the front of the body toward the left shoulder. The right arm was thus left free, and the left for the most part covered. The toga was not usually worn at home, the tunica being regarded as sufficient; and for out-of-door wear it gave place under the Empire, except on formal occasions, to lighter and more convenient garments, chiefly of foreign origin. See COSTUME.

TOGGLE JOINT (probably connected with ME. *toggen, tuggen*, to tug, variant of *tukken*, AS. *tucian*, to pull, and akin to Eng. *tow*). A mechanical appliance acting on the principle of the inclined plane. Let *ad* and *ag* represent the arms of the toggle joint, with the joint at *a*. Then, if the arms are brought to a perpendicular, the end *d* being stationary, the point *a* will move through the arc *ab* to *b*, and at each point in the arc in the direction of a tangent at that point. As the point *a* approaches *b* the tangent will become more and more horizontal, and at last perpendicular to the arms *ad* and *ag*. When they form one and the same straight line the weight *w* will have been raised to twice the height *bc*. The form in the figure here presented is given to show more clearly the action of the knee and elbow joints in man, but that which is more frequently used, particularly in hay and cotton presses (to which the appliance is peculiarly adapted), makes the ends *d* and *g* of the arms approach each other, applying the power at *a* making *ac* the perpendicular. It will be seen that on the application of power the motion of the point *a* will at first be quite rapid (when the hay or cotton is loose), becoming slower and slower as the points *d* and *g* approach each other, so that when both arms become very nearly perpendicular the weight or resistance will move very slowly; but the power will be extremely great, and adapted to the resistance offered by the greatly compressed bale. See INCLINED PLANE.



TOGOLAND, tō'gō-länt. A German protectorate in West Africa, bounded by Dahomey on the east, the Gulf of Guinea on the south, and the Gold Coast Colony on the west and north (Map: Africa, E 4). The northern boundary has not yet been definitely settled. Area, estimated at 33,000 square miles. The low sandy coast rises toward the interior, which is mostly undulating and traversed by the Aposso Mountains, entering from northern Dahomey. The chief rivers are the Mono, the Dako, the Sio, and the Haho. There are many coast lagoons. The climate is moist and unhealthful. Togoland possesses abundant natural resources, which are gradually being developed. Extensive cocoanut plantations have been established along the coast, and good crops of corn and rice are raised. Tobacco and coffee are also cultivated. The chief products for export are palm oil and kernels, rubber, ivory, and copra. The imports and exports amounted in 1901 to $1,124,050 and $878,351 respectively. The chief ports are Lome, which is also the seat of administration, and Little Popo. A narrow-gauge railway line is being constructed between the two places. Togoland comes nearer to being self-supporting than any other German colony. The population is estimated at 2,500,000, chiefly Sudanese. Togoland was declared a German protectorate in 1884.

TOINETTE, twä'nĕt'. In Molière's *Malade imaginaire*, the bright young servant of the title character. She constantly irritates her master, but makes his interests her own, and brings about the marriage of Angélique and Cléante.

TOKAIDO, tō-kī'dō. An ancient division of Hondo, the principal island of Japan, occupying the eastern part of the island. It developed later than the western and southern parts of the island, but since the triumph of Yoritomo (q.v.) at the end of the twelfth century it has been dominant, ruling Japan from Kamakura and Yedo (Tokio). It is now the most populous and richest part of Japan.

TOKAIDO. A name applied to the great highway which connects Tokio with Kioto. It is 323 miles long. Starting from Nihombashi (Jap., Bridge of Japan), in Tokio, it skirts the Bay of Tokio and the Pacific, climbs the Hakone Mountains across the peninsula of Idzu, again follows the coast line through many large towns to Kuwana, 247½ miles from Nihombashi, where it turns inland to Lake Biwa and Kioto. It is the most famous though not the most ancient highway in Japan. Here in the days of the Tokugawa régime the daimios from the centre and west of Japan traveled with their trains of armed men to and from their enforced residence in Yedo. The sides of the road were planted with lines of great cedars, there were inns at distances of every six or seven miles, and the journey in palanquin and on slow-walking horses took ten days. Since the abolition of the feudal system the Tokaido has lost its romance, and by the completion of the railway between the cities its importance has diminished.

TO'KAJ (*Ger. pron.* tō'kī), **TOKAY,** tō'kai. A town in the County of Zemplin, Hungary, at the confluence of the Bodrog and Theiss, 41 miles north of Debreczin, on the Szerencs-Debreczin Railway (Map: Hungary, G 2). In the vicinity are sapphire and carnelian deposits and saltworks. Tokaj is celebrated for its wines. The population of the commune, in 1900, was 26,711; of the town, about 5500, mostly Magyars.

TOKAT, tō-kät' (Arm. *Evtoghia*). The capital of a sanjak in the Vilayet of Sivas, Turkey in Asia, 125 miles northeast of Kaisarieh (Map: Turkey in Asia, G 2). It is in a hilly region abounding in fine scenery, and is well laid out. The chief features of interest are the Byzantine castle and the old Roman tombs. The town is the commercial centre for a section producing fruit, hemp, corn, and tobacco, and has manufactures of cotton cloth, dyestuffs, copper wares, and leather. Population, in 1901, 29,890, the majority being Mohammedans. During the Middle Ages Tokat, the ancient *Dazimon*, was an important trading centre. It was the scene of an Armenian massacre in 1895.

TOKEN MONEY. See Money.

TOKIO, tō'kē, or **TOKYO** (formerly Yedo) (Jap., Eastern Capital). The capital of Japan, situated on the southeast side of the island of Hondo, on the Bay of Tokio, in latitude 35° 41′ N., longitude 139° 46′ E. (Map: Japan, F 6). The city covers a wide area, and is exceedingly irregular in outline, being, indeed, a number of towns grown together rather than a single city laid out according to design. It is divided into two unequal parts by the river Sumidȧ. The eastern portions along the river and fronting the bay are level and low, the western rise into considerable hills with a dense population in the valleys which separate them. The chief feature is the palace inclosure within the grounds of the ancient castle. These grounds under the old régime were very extensive and were surrounded by an outer wall and moat more than two and a half miles in length. This wall has been leveled in part and the moat filled up. Within was a second moat and wall, and even a third in parts. The old residence of the Shogun within the third wall was burned in 1872 and has been replaced by the palace of the Emperor, in a mixed Japanese-European style of architecture. It stands in the ancient and beautiful park called Fukiage. The palace was first occupied by the Emperor in 1889. Much of the area inclosed by the outer wall and moat was occupied in the past by the mansions of the feudal barons, but these are now destroyed and in their place are the various buildings devoted to the use of the Government, in European style and devoid of especial interest. To the east of the castle is the distinctively commercial portion of the city, with banks, warehouses, shops, hotels, restaurants, newspaper offices, and dwellings. A long main street, variously named in different parts, and without any general designation, passes through this part of the city from northeast to southwest. It is broad, with rows of trees, a tramway, electric lights, and rows of low buildings of stone and brick in a semi-European style. From it lanes and streets diverge in all directions, for the greater part lined with small wooden buildings, inexpensive and without pretension. Mingled with them are storehouses made of mud or clay, and incongruous modern buildings. Of late years some of the streets have been straightened and widened, wooden bridges have been replaced by iron ones. and many improvements have been introduced. Nevertheless the old styles of shops and dwellings are in so vast a majority that this part of Tokio is still essentially as in the centuries past.

In the northern part of the city is the arsenal, with the beautiful garden attached which formerly belonged to the mansion of the Barons of Mito. Not far away is the ancient building used as a library which was once the great Confucian College. Farther to the north on the site of the town mansion of the Baron of Kaga is the Imperial University. (See Tokio, University of.) Farther to the east is the great park, Ueno, with the mortuary shrines of eight of the shoguns of the Tokugawa family, and the Imperial Museum filled with objects of great interest. Still farther to the east is the great temple of the goddess of mercy, Kwannon Sama, with a park, many shrines, a pagoda, rows of shops, and innumerable places of amusement. Across the river Sumida, the eastern portion of the city embraces the two districts called Honjo and Fukiage, a quiet region known to visitors chiefly for its displays of flowers, the cherry blossoms at Mukojima, the wistaria at Kameido, and the iris at Horikiri, and for the great wrestling matches at the temple E-ko-in. On the west bank of the Sumida was the Foreign Concession, but since the abolition of extraterritoriality foreigners are permitted to live in all parts of the city. In the same district, on the shore of the bay, is the Imperial park known as Enryo-kwan. In the southern part of the city is the park called Shiba, with the magnificent mortuary shrine of the second Shogun, and the almost equally fine shrines of six others. Beyond the park, still following the line of the bay, is the Temple of Sankakuji, famous for the little cemetery containing the tombs of the forty-seven Ronins. To the west of the palace are many large residences surrounded by gardens and high walls. In the suburbs there are many delightful resorts, especially Meguro, Oji, Futago, and Ikegami. The city is protected against fire by a well-organized fire department equipped with steam fire engines. It has also an excellent police system. The affairs of the city are administered by a mayor, a municipal council, and a municipal assembly. Tokio proper has few industrial interests, although there are numerous factories in the neighborhood. It is unfavorably situated for commerce, as the Sumida River is unnavigable for vessels of large tonnage. Trade is carried on by way of Yokohama. Population, in 1898, 1,440,121.

Originally an obscure hamlet called Yedo (gate of the inlet) stood on the seashore in the district of the city now called Asakusa, while most of the busiest parts of the present city were covered with the waters of the bay and of lagoons. Near Yedo a rude castle was built in the fifteenth century, but the place continued without importance until, toward the end of the sixteenth century, Tokugawa Ieyasu took possession of it, and in 1603 made it the seat of his government of the Empire. He retained the ancient name Yedo, but made it speedily the most important city in Japan and the capital in a sense never known before. Ieyasu commanded artisans and merchants to move to his new city from Kioto and Osaka. He occupied the ancient castle, and in the days of his grandson the new castle was constructed. But the most characteristic and original feature of Yedo was caused by the requirement that the feudal barons should spend a portion of every second year in the city and that in their absence members of their families be left as hostages. In consequence the feudal barons built town mansions, surrounded them with beautiful gardens, and for the first time in the history of Japan came. in time of peace, into contact with each other. The result was rivalry in display and a luxury and extravagance before known only in Kioto in connection with the Imperial Court. From this time Yedo took on the appearance so often described by travelers. Its population was immense, and the success of the policy of Ieyasu is proved by the fact that it was never entered by a hostile army, nor so much as attacked or besieged. The records of the city contain accounts of many terrible catastrophes. Its slight wooden buildings furnished excellent fuel for fire, and repeatedly it was destroyed in conflagrations, until in recent times the building of rows of brick and stone houses has furnished efficient barriers. It has also suffered greatly from earthquakes and from epidemics, while terrible storms have destroyed thousands of dwellings. After the weakening of the House of Tokugawa, in 1863, the requirement of residence for the barons was relaxed, and the population fell off greatly. But after the fall of the shogunate on September 13, 1868, it was made the eastern capital, and its name was changed accordingly to Tokio. It was opened to the residence of foreigners in 1869. Though nominally only the eastern capital, yet, as the residence of the Emperor, the meeting place of the Diet, and the seat of the Government in all departments, it is in reality the only capital of the Empire, Kioto retaining an empty title merely.

TOKIO, UNIVERSITY OF. A Japanese university founded in 1868 by the union of two older schools, as one of the results of the great political and social revolution of that year. It has grown with the growth of modern Japan. At first officered largely by foreigners, these have been gradually superseded by Japanese, for the most part trained in Europe and the United States. The university is a Government institution. Its administration is vested in a president and a board of councilors, two from each college, named by the Minister of Education, for a term of five years. The colleges comprise law, medicine, engineering, philosophy, history, mathematics, and science. Two degrees are given, one for work in course, the other for special distinction. The university includes an observatory and a library. There were 2908 students in 1900-01.

TÖKÖLYI, tĕ'kĕl-yĭ, or **TÖKÖLI**, IMRE (Emerich), Count (1656-1705). An Hungarian patriot. He belonged to a Lutheran family and was born at the Castle of Késmárk, in the County of Zips. His father, Count Stephen, was implicated in the conspiracy of Zrinyi, Rákóczy, and Frangipani against Leopold I. of Austria; and after his death, and the execution of Zrinyi and others, young Tökölyi sought an asylum in Poland, where he had large possessions. After vain endeavors to recover from the Emperor his patrimonial estates, he obtained the support of Apafi, Prince of Transylvania, and in 1678 he took the lead in the insurrection in Hungary. He advanced victoriously, capturing a number of towns, and even penetrating into the heart of Moravia. The Turkish Sultan, Mohammed IV., espoused his cause, and in 1682 declared him Prince of Hungary under Turkish suzerainty. Tökölyi joined Kara Mustapha in the great onslaught on Austria in 1683, but after the disaster to the Turks at Vienna many of his followers fell off from him, and in 1685 he was imprisoned by the Turks. He was soon released, however, and resumed operations, but without success. In 1689 he was made Prince of Transylvania by the Sultan, and invaded that country with a Turkish army, but was forced back into Wallachia. He took part in the subsequent campaigns against Austria, and after the Peace of Karlowitz he was made by the Sultan Prince of Widdin and resided as his pensioner at Constantinople, where he died.

TOKUGAWA, tō'kōō-gä'wȧ. The name of the great family which ruled Japan for more than two centuries and a half (1600-1868). Its founder was Ieyasu, one of the five generals from the east of Japan who restored peace after centuries of feudal strife and anarchy. He claimed descent from an early Emperor through the Minamoto family, and took their hereditary title 'shogun' (general). He made Yedo, then an obscure village, the capital of Japan, reformed the laws, and established the system which was characteristic of Japan and made it unique in the eyes of foreigners. Ieyasu retired in 1604 to Shidzuoka, but continued to rule through his son until his death in 1616. His descendants were shoguns to the number of fourteen. The greatest of them was Iemitsu, his grandson, who ruled from 1623 to 1649. Most of the Tokugawa shoguns were weaklings and debauchees. The fifteenth shogun resigned his powers to the Emperor in 1868 and retired to Shidzuoka. Since that time the family has exerted no political power.

TOKUSHIMA, tō'kōō-shē'mȧ. The capital of the Prefecture of Tokushima, in Japan, near the coast in the northeastern part of the island of Shikoku (Map: Japan, D 6). It is the largest city on the island, and is beautifully situated. Population, in 1898, 61,501.

TO'LAND, JOHN (1670-1722). A deistical writer. He was born near the village of Redcastle, in the County of Londonderry, Ireland. He was brought up as a Roman Catholic, but in his sixteenth year was a Protestant. He entered the University of Glasgow in 1687, but removed to that of Edinburgh, where he took the degree of master of arts in 1690. Thence he passed to Leyden, where he entered upon theological studies. On his return to England he resided for some time at Oxford, where he was already looked upon as a free-thinker. *Christianity Not Mysterious*, which he published in London in 1696, and in which he fully avowed his principles, created a sensation in the theological world. In the following year Toland returned to Ireland, but his book was burned publicly by order of the Irish Parliament. Finding it necessary to flee from Ireland, Toland returned to London, where he published a defense against this judgment of the Irish Parliament; but he soon afterwards turned his pen from theological to political and literary subjects. A pamphlet entitled *Anglia Libera* (1701), on the succession of the House of Brunswick, led to his being received with favor by the Princess Sophia at the Court of Hanover, and to his being sent on a kind of political mission to some of the German courts. In 1705 he outstripped the boldness of his former opinions, openly avowing himself a pantheist. In this course he was emboldened by the patronage of Harley, in whose service he had engaged as a political pamphleteer, and by whom he was sent abroad to Holland and Germany in 1707. He returned to England in 1710; and having forfeited the favor of his patron, or at least having separated from him (1714), he engaged as a partisan pamphleteer on the side of Harley's adversaries. His after-life was that of a literary adventurer, and was checkered by every variety of literary conflict and pecuniary struggle.

TOLBOOTH. A massive structure, dating from various periods, on Castle Hill, Edinburgh, removed in 1817. It served as a Parliament House, a court, and a prison. It is known as the Heart of Midlothian, and many relics connected with it were preserved in Sir Walter Scott's collection at Abbotsford.

TOLDY, tōl′dĭ, Ferencz (1805-75). An Hungarian writer on the history of literature. His real name was Schedel. He was born in Budapest, and educated there as a physician. In 1830 he founded with Paul Bugát, at Budapest, the *Orvosi Tár*, the first Hungarian medical journal, and in 1833 he became professor extraordinary of dietetics at the university. In 1835 he was elected secretary of the Academy, a post which he retained until 1861, and in 1836 he founded the great Kisfaludy literary society, of which he became president in 1841. After 1849 he devoted himself entirely to the history of Hungarian literature, and in 1860 was appointed professor of that subject in the university. His historical and critical works in German and Hungarian include: *Die ungarische historische Dichtung vor Zrinyi* (1848); *Kulturzustände der Ungarn vor der Annahme des Christentums* (1850); *A magyar nemzeti irodalom története* ("History of the Hungarian National Literature," Budapest, 1851); *A magyar költészet története* ("History of Hungarian Poetry," 1855 and 1867); *Marci chronica de gestis Hungarorum* (1867); and *A magyar költészet kézikönyve* ("Handbook of Hungarian Poetry," 2d ed. 1876).

TOLEDO, tô-lā′ᴅô. The capital of the Province of Toledo, Spain, 42 miles south-southwest of Madrid, on the Tagus (Map: Spain, D 3). The hundred-towered city, situated on a bold promontory, bordered on three sides by a bend of the Tagus and surrounded by a lofty wall, preserves almost unchanged its mediæval appearance. The Tagus is spanned by the bridge of San Martín, a well-constructed specimen of the military architecture of the Middle Ages, and the thirteenth-century Bridge of Alcántara; the walls are pierced by a number of gates, of which the most beautiful is the Arabic Puerta del Sol. The houses of the city cluster in the form of a semicircle around the Alcázar. The streets are winding, narrow, and steep. Among the many interesting churches are the Gothic Cathedral dating from 1227, with its forty chapels and library of ancient manuscripts; the cloister of San Juan de los Reyes, a gift of the Catholic sovereigns; Santa Maria de la Blanca, a Jewish synagogue of the twelfth century, rebuilt and consecrated as a church in 1507; and El Tránsito, another synagogue dating from 1366, and given by the Catholic sovereigns to the Knights of Calatrava. Many former convents are devoted to the service of the State as prisons and hospitals. The city hall with two towers and classic façade dates from the fifteenth century. There are a beautiful theatre, and a provincial library containing 70,000 volumes, housed in the archbishop's palace. Toledo is the seat of an archbishop who bears the title of primate of all Spain—one of the few survivals of the period when the city was the centre of Spanish national life. It is largely untouched by modern industrial life and exists as a survival of the golden age of Spanish chivalry. The climate is rather unhealthful and the surrounding region largely barren and cheerless. The city has manufactures of spirits, beer, chocolate, varnish, church ornaments, cloth, silk goods, pottery, brick, and fans. But the most famous establishments of Toledo are those devoted to the manufacture of arms, for even before the time of Roman domination Toledo blades were famous. The present Government factory dates from 1777; within recent years establishments for the manufacture of cartridges have been added. There are also several private establishments for the manufacture of arms and ammunition. Population, in 1900, 23,375.

Nothing certain is known of the origin of Toledo. Under the name of *Toletum* it is mentioned by Livy in connection with the date B.C. 192. After the period of Roman sway it fell first into the power of the Alani, and a little later came under the control of the Visigoths, of whose kingdom it became the capital. From A.D. 400 to 701 it was the meeting place of eighteen Church councils which exercised a great political as well as religious influence on Spain. Under the Arabs it was a city of great importance. After the dissolution of the Caliphate of Cordova it was the seat of a short-lived Mohammedan kingdom. Alfonso the Valiant of Leon and Castile conquered this State in 1085 and gave the name of New Castile to the region. The town became an important place of residence for the Castilian monarchs. In the War of the Communes (1520-21) Toledo espoused the popular cause. In 1808 it took part in the national uprising against the French, and in 1810 and 1813 suffered much from the vandalism of their armies. Consult Camero, *Historia de la ciudad de Toledo* (Toledo, 1863).

TOLEDO. A town of Cebú, Philippines, situated on the central part of the west coast, 39 miles from Cebú (Map: Philippine Islands, H 9). Population, 10,900.

TOLE′DO. The third city of Ohio and the county-seat of Lucas County, situated at the mouth of the Maumee River where it enters Lake Erie by way of Maumee Bay; 130 miles north of Columbus (Map: Ohio, C 2). The Maumee through the city averages half a mile in width, and is navigable for lake vessels of the largest size. There is an excellent harbor with 25 miles of docks, eight miles of which are devoted to coal and ore. A straight channel, 400 feet wide and 21 feet deep, leads to the lake. Six passenger steamship lines connect the city with Mackinac, Detroit, Montreal, and other river and lake cities. Nineteen railroads enter the city, including five divisions of the Lake Shore and two divisions of the Wabash. It is the terminus of the Ohio Central and is tapped by the Michigan Central. It is the terminus of the Pennsylvania, Toledo, Saint Louis and Kansas City, Cincinnati, Hamilton and Dayton, Hocking Valley, Wheeling and Lake Erie, Pere Marquette, Detroit, Toledo and Milwaukee, Ann Arbor, and Grand Trunk railroads. These lines are intersected and connected by the Toledo Railway and Terminal Company's belt line, which maintains an immense union passenger and freight depot and a lake transfer house. There are 110 miles of street railroads reaching every portion of the city. The river is spanned by five railroad and two passenger bridges.

Just outside the city limits are the flourishing suburbs of Rossford, with the celebrated Ford plate glass works, and West Toledo. A large portion of the city rests on made ground, as the greater part of its site was formerly a swamp, the first settlements having been made on two hills that rose from this swamp. The streets are paved with brick, asphalt, and stone, and throughout the residential portions are well planted with shade trees. The city has 848 acres of parks, including Walbridge Park, with fine zoölogical gardens and the city greenhouse; Ottawa Park, with a public golf course; Riverside, Bay View, Navarre, City, and Collins parks; and planted triangles in all sections. The outlying parks are connected by a fine boulevard about 25 miles in length, as yet completed only in part. Public playgrounds for children are situated in populous quarters of the city. There is a municipally owned cemetery which is self-supporting.

Among the more prominent buildings are the county court-house in the centre of the city with a beautiful park containing a fine statue of President McKinley; the Public Library; the Soldiers' Memorial Building, erected by the city at a cost of $100,000 for the soldiers and sailors of Lucas County; the Toledo Club; the Spitzer office building; and Saint Patrick's and Saint Paul's churches. There are 42 public school buildings, including two high schools and a manual training school and university. Toledo Medical College has a high standing and is afforded special clinical facilities by the Toledo and Saint Vincent's hospitals, as well as by a number of private hospitals. There are numerous private educational institutions, including Saint John's College. The Public Library (46,000 volumes) maintains a reference library and reading rooms. It has five sub-stations.

Toledo is the meeting point of the iron ore from the Lake Superior region and the coal of Ohio and Virginia. It is the central point of the northwestern Ohio oil fields, and is surrounded by a fine agricultural country especially adapted to fruit-gardening. The building of lake and ocean vessels is extensively carried on, and among the more important manufactures are plate glass, cut glass, bicycles, automobiles, agricultural implements, malt liquors, clothing, malleable iron, foundry products, tobacco, etc. In the census year 1900 the various industries were capitalized at $25,592,000 and had an output valued at $37,372,000. There is a very large grain trade, and the clover-seed market is second only to that of Chicago. Vessels to the number of 2313, having an aggregate tonnage of 1,854,262, touched at the port in 1902. In shipment of coal Toledo leads every lake port but Cleveland.

The government, under the new charter, is vested in a mayor, a council of 16 members, a board of public service, city solicitor, treasurer, and auditor, all elected by the people; a board of public safety appointed by the mayor if the council indorses his appointments, if not, by the Governor of the State; and a number of minor boards, health, library, sinking fund, etc., appointed by the mayor. Toledo spends annually more than $2,800,000, exclusive of amounts for public schools; but a considerable portion of this goes for interest on the bonded debt. The waterworks are municipally owned and operated, and have a capacity of 45,000,000 gallons, with an average daily consumption of 10,000,000 gallons. The supply is drawn from the Maumee River. Plans are prepared for a $750,000 filtering plant. The sewerage system comprises 140.3 miles of mains.

The site of Toledo was a favorite resort of the Miami Indians in the eighteenth century. The place was first settled in 1832 and was chartered as a city in 1837, its population then being less than 1000. With the surrounding territory it was claimed for several years by both Ohio and Michigan, the dispute culminating in 1835 in the so-called 'Toledo War' (q.v.)—a war of words only. The population in 1840 was 1222; in 1850, 3829; in 1860, 13,768; in 1870, 31,584; in 1880, 50,137; in 1890, 81,434; and in 1900, 131,822. The total in 1900 included 27,822 persons of foreign birth and 1710 of negro descent.

TOLEDO WAR. A boundary controversy which arose in 1835 between the State of Ohio and the Territory of Michigan. Congress in the Ordinance of 1787 had reserved the right to form new States out of that part of the territory northwest of the Ohio River "lying north of an east and west line drawn through the southerly bend or extreme of Lake Michigan." Ohio was admitted as a State in 1803, the above line being described in the act as its northern boundary, though the State Constitution claimed more territory. When in 1805 Michigan Territory was organized, and, later, Indiana and Illinois became States, the most confused ideas existed on the boundary question. A survey was made by order of Congress in 1817 which established the present line. The old line had included in Michigan the city of Toledo, and this was the main point in dispute. In 1835 Ohio laid claim to all within the new line, known as the Harris line, and proceeded to organize townships therein. Michigan declared the intention of resisting such invasion, and the militia of both sides were called upon to maintain the alleged rights of their respective governments. An opinion of the United States Attorney-General, B. F. Butler, favored Michigan; President Jackson sent out a 'peace commission' with no result, and serious conflict seemed imminent. In September, 1835, the Michigan troops occupied Toledo to prevent the formal organization of Wood County by Ohio officers. The latter, however, accomplished their purpose secretly and withdrew. The trouble was finally settled by the admission of Michigan into the Union on condition that she accept the Harris line, while as a make-weight that State was given the upper Wisconsin Peninsula, which afterwards proved from its mineral wealth to be far more valuable than the disputed territory.

TOLENTINO, tō'lĕn-tē'nō. A town in the Province of Macerata, Italy, on the Chienti, 30 miles south-southwest of Ancona (Map: Italy, H 4). The cathedral has a good portal by Rosso. The churches of San Catervo and San Francesco possess noteworthy frescoes and reliefs. There are manufactures of machinery, silks, woolens, wine, and olive oil, and stone quarries. Tolentino was the scene of Murat's defeat by the Austrians on May 2-3, 1815. Population (commune), in 1901, 12,872.

TOLERATION (Lat. *toleratio*, from *tolerare*, to endure, tolerate; connected with Gk. *τλῆναι*, *tlênai*, to bear, endure, Skt. *tul*, to lift up, weigh). The recognition of the right of private judgment; specifically, such recognition, on the part of the Government, in matters of faith and worship. By governmental toleration is granted not only the liberty of holding and putting into practice varied religious opinions, but of teaching and defending them publicly. But thereby no permission is given to violate the rights of others, or to infringe laws designed for the security of the governing power or for the protection of decency, morality, or good order. See LIBERTY, RELIGIOUS.

TOLIMA, tō-lē′mȧ. A southern department of Colombia, South America, bounded by the departments of Antioquia and Cundinamarca on the north, Cundinamarca and Cauca on the east, and Cauca on the south and west (Map: Colombia, B 3). Area, about 18,500 square miles. The western and eastern parts belong to the region of the Central and Eastern Cordilleras respectively, while the central belongs to the valley of the Upper Magdalena. Agriculture is carried on chiefly in the central part, where sugar, cacao, rice, and tobacco form the chief products. The stock-raising industry is also important. The mineral deposits of the department are extensive, but are almost utterly neglected. The climate along the river is tropical, but it is cold in the upper mountain regions. There are no good means of communication. The population was estimated at 230,000 in 1892. Capital, Ibagué (q.v.).

TOLIMA. A quiescent volcano in Colombia rising from the Central Cordillera of the Andes, 75 miles west of Bogotá. It is the highest peak in the country, having an altitude of 18,325 feet.

TOLL (AS. *toll*, *tol*, OHG. *zol*, Ger. *Zoll*, toll, tax; probably from Lat. *telonium*, from Gk. *τελώνιον*, custom-house). In law, a charge or duty paid for some service, or the license to use something, generally in the nature of a public franchise. The right to exact toll is almost entirely created by statute, and generally is only granted to persons who maintain some public convenience, as a ferry, bridge, or turnpike. See FRANCHISE; FERRY; HIGHWAY.

TOLLENS, tŏl′lĕns, HENDRIK CAROLUSZOON (1780-1856). A Dutch poet, born in Rotterdam. He was the son of a merchant, and himself was engaged in commerce till 1846. His early work followed French models and ideas. His first original works were poems (1802), followed by *Lucretia* (1805) and other historical tragedies, and works of much strength. His subsequent productions were mainly lyric and more distinctively national and simple. These poems, gathered under various titles (1808-53), show powers undiminished to the last. He won wide popularity through the national song *Wien Neêrlandsch bloed*. His best work is *Tafereel van de overwintering op Nowa Zembla* (Picture of the Wintering on Nova Zembla, 1819).

TOLOSA, tō-lō′sȧ. The former capital of the Province of Guipúzcoa, Spain, 16 miles southwest of San Sebastián, in the valley of the Oria, and on the Irun-Burgos line of the Northern Railway (Map: Spain, D 1). It contains the Church of Santa Maria, the Palacio Idiaquez, and two handsome *paseos*. During the nineteenth century it was an important Carlist centre. Its principal manufactures are paper, woolens, steel, brassware, and malt liquors. Population, in 1900, 8100.

TOLS′TOY, *Russ. pron.* tôl-stoi′, ALEXEI KONSTANTINOVITCH, Count (1817-75). A Russian author. He was born in Saint Petersburg, and studied at Moscow. After seeing diplomatic service and traveling extensively, he took part in the Crimean War, and subsequently held a high position at the Court. He wrote lyric and epic poetry and one novel, *Prince Serbryanyi* (trans. by J. Curtin, 1893), after the manner of Sir Walter Scott. His chief literary achievement, however, was his dramatic trilogy, *The Death of Ivan the Terrible* (1866; Eng. trans. by F. Harrison, London, 1869), *Czar Fedor Ivanovitch* (1868), and *Czar Boris* (1870). All three parts were published together at Saint Petersburg in 1876.

TOLSTOY, DMITRI, Count (1823-89). A Russian statesman. After serving in the Ministry of the Navy, he became procurator of the Holy Synod in 1865 and Minister of Public Instruction in 1866. In both positions his reformatory measures aroused violent opposition, and especially through his undue preference for the classical languages in the intermediate schools, and his petty tutelage over the universities, he incurred such widespread enmity that he was obliged to resign in 1880. Appointed president of the Academy of Sciences in 1882, he held the post of Minister of the Interior in 1883-85. He was the author of a history of the finances of Russia to the reign of Catharine II. (1847), and of *Le catholicisme romain en Russie* (1863-64).

TOLSTOY, LYOFF (LEO) NIKOLAYEVITCH, Count (1828—). A famous Russian author. He was born on his father's estate at Yasnaya Polyana, in the Government of Tula, August 28, 1828. In 1843 he studied Oriental languages at the University of Kazan, a year afterwards he began to study law, and he received his diploma in 1848 'knowing literally nothing,' as he asserted later. He lived on his estate until 1851, when his brother, an artillery officer, induced him to visit the Caucasus. Charmed by the life there, he joined an artillery regiment, and in 1853 was attached to the Army of the Danube during the Crimean campaign. During this period he published his *Childhood*, *Incursion*, *Boyhood*, *The Morning of a Proprietor*, and *The Cossacks*. He took part in the defense of Sebastopol, and embodied his experiences in *Sebastopol in December, 1854*, *Sebastopol in May, 1855*, and *Sebastopol in August, 1855*. These sketches immediately placed Tolstoy among the great pen-masters of the day. They painted the horrors of war, with its show heroes and real heroes, in the spirit of that cruel, cold-blooded realism which is the chief trait of Tolstoy's unyielding logic. It was naked truth and nothing else. At the end of the war Tolstoy resigned and went to the capital. A visit abroad in 1857 sowed the seeds of his disappointment in modern civilization, and *From the Memoirs of Prince Nekhlyudoff* (*Luzern*) was an indignant protest against the poverty and ignorance in modern society. He settled on his estate at Yasnaya Polyana and devoted himself to school work among the peasants. A second visit abroad to study the German methods of education served only to intensify his disappointment, and his own methods, as embodied in practice and in his pedagogical publication, *Yasnaya Polyana,* were an attack on all existing standards, and called forth a heated discussion in pedagogical circles. About this time work on a long novel, *The Decembrists* (of which only three chapters appeared), led Tolstoy to the study of the reign of Alexander I. and his interest gradually was centred on the great Napoleonic campaign. Thus he came to write his *War and Peace* (1864-69)—a colossal prose epic, embracing the whole of Russia at the beginning of the nineteenth century, from the Emperor down through all stages of society.

Again the elemental forces of the common people are lovingly dwelt upon in contrast with the artificiality of the upper classes. With the artistic exposition is intertwined a new philosophy of history, which in the last analysis is but old fatalism in a new guise. After this, pedagogical pursuits absorbed Tolstoy's energies, until in 1875-76 *Anna Karenina* appeared in *The Russian Messenger.* This great work deals with the unlawful relations of the social lion, Vronski, and Anna, wife of Karenin, the bureaucratic machine. The great questions of human life which centre around marriage are treated here with unapproachable mastery, force, and directness. The novel has a second plot—the life of the rationalist proprietor, Konstantin Levin, and his wife, Kitty. Amid perfect home surroundings, he is discontented, and even thinks of suicide, until he is 'regenerated' through contact with the common people, and finds new strength in manual labor. According to later statements of the author this work contained much autobiographical material.

After this, philosophical and social questions took complete hold of Tolstoy, and for more than a decade he gave to the world a series of religious, social, and philosophical treatises, like *Commentary on the Gospel; Letter on the Census* (1883); *Confession; My Religion; What Shall We Then Do?* a few short stories written for the people, *The Death of Ivan Ilyitch* (1885), and the dramas *The Power of Darkness* and *Fruits of Culture.* Works of literary art were also produced at this period. *The Kreutzer Sonata* (1888), denouncing marriage, raised a storm of indignation on both sides of the Atlantic. *What Is Art?* (1898), a great philippic against art as commonly understood, although leaving the question unanswered for many, was a brilliant contribution to the literature of the subject. It contains ideas of great depth and breadth, interspersed with paradoxes, and is interesting as a proof of the thoroughness with which Tolstoy goes into his work. It is the result of a minute study of every writer of any consequence on the subject. In 1899 a new work of fiction, *Resurrection,* appeared. The central figure, Nekhlyudoff, while acting as a juror, recognizes in the culprit the woman whom he had betrayed in his youth. Torn by remorse, he finally comes to the conclusion that he is the real cause of the woman's guilt and downfall, and wishes to expiate his former wrong-doing by accompanying her to Siberia and sharing with her all hardships of the exile. All the bitterness that had been collecting in the heart of the author seems to have found free utterance, and the work is a powerful arraignment of all existing institutions. In 1900 a drama, *The Corpse,* appeared. In March, 1901, the Holy Synod issued the excommunication with which he had been threatened for nearly thirty years.

Tolstoy has the same power of psychological analysis that characterized Dostoyevski (q.v.), but excels him in range and variety. Dostoyevski does not get beyond the magic circle of the middle classes, while Tolstoy is equally at home in all walks of life. He draws, with the same firm hand and correctness, the rulers of men's fates, courtiers, generals, petty officers, common soldiers, great noblemen, peasants, prisoners in the dungeons and on the great road to Siberia, men, women, children—everywhere he strikes the very bottom of human character. There is none of Dostoyevski's nerve-harassing for the sake of satisfying the author's own 'cruel talent'—the great reformer is actuated by nothing but the desire to get at truth, and his conscience will not rest until he arrives at it. Hence Tolstoy's works, although they depict the rise and evolution of controlling passions with a master hand, and contain scenes that are entrancing in beauty, still possess none of those elements of piquancy that attract the many to read works of the realistic school. He came to know his peasants through his pedagogical work among them, and became a great believer in the salutary influence of labor. The philanthropic work during the famines of 1873 and 1891 gave him an impulse for the "Simplification of Life" which filled the foreign periodicals with sensational pictures and descriptions of Tolstoy in a cheap shirt-blouse, girded with a rope, with his hands on a plow, tilling his estate at Yasnaya Polyana. Gradually he came to defy all unnecessary comforts of life, did cobbling and all manual labor for himself, preaching *Karma* and the doctrines of Lao-Tse. The principle of simplification was carried into his religious beliefs: all teaching not coming from Christ Himself was ruthlessly discarded, and a new gospel reconstructed from the old. The doctrine of evangelic humility was carried to the extreme of his famous doctrine of non-resistance—especially remarkable side by side with individualism of an extreme kind. All human institutions—kingly power, State, Church, judiciary, jury, army, even marriage—were in turn anathematized as standing in the way of the natural development of the powers of an individual. Always carrying his logic to its inexorable limits, Tolstoy had to denounce his own literary achievements along with all products of civilization, as begotten of idle fancy and human craving for the plaudits of the world. This double individuality of Tolstoy the artist and Tolstoy the man is perhaps the most striking case in the annals of literature.

In 1862 Tolstoy married Sophie Andreyevna Behrs of Moscow, by whom he had eight children. One son, LYOFF LYOVITCH, who inherits his father's literary inclinations, has attracted considerable attention by his sketches in periodical publications.

Tolstoy's collected works were published at Moscow in 14 volumes in 1889-95 (8th edition). An English translation by N. H. Dole of the complete works in 12 volumes with an introduction by the translator was published (New York, 1900). Most of Tolstoy's works are also obtainable in French translations. There is a vast literature on Tolstoy and his works. The best books in Western languages are: De Vogüé, *Le roman russe* (Paris, 1866); Löwenfeld, *Gespräche mit Tolstoy* (Berlin, 1891); id., *L. N. Tolstoy, sein Leben, seine Werke, seine Weltanschauungen* (ib., 1892); Eugen Zabel, *Litterarische Streifzüge durch Russland;* P. A. Sergeyenko, *How Tolstoy Lives and Works*, translated by I. F. Hapgood (New York, 1899). Consult also: Howells, *My Literary Passions* (New York, 1895); Ward, "The Gospel of Count Tolstoy," in *Prophets of the Nineteenth Century* (ib., 1900).

TOL'TEC, or **TOLTECA**, tôl-tā'kȧ (People of Tollan, the modern Tula). An early cultured people of Mexico, the subject of considerable historical controversy. According to the general Mexican tradition they were the most ancient civilized race of Mexico, preceding the arrival of the ruder Aztec, who derived their own best culture by absorption from the Toltec. Their capital was at the now ruined city of Tollan or Tula, whence their dominion extended over all the central plateau, eastward to the Gulf and southward to the Maya border. After some centuries of flourishing existence their empire fell to pieces through internal dissensions and the invasion of barbarous northern tribes about the close of the tenth century, the survivors from war and famine being either incorporated by the conquering Aztec or driven southward to become the culture pioneers among the southern tribes as far as Guatemala. The entire subject of Toltec history is so interwoven with myth and disfigured by exaggeration and uncertainty of dates that it is difficult to arrive at any conclusion, but enough remains to indicate that the Toltec had an important historic existence, either as a distinct race finally absorbed by conquering invaders from the north, or, which is more probable, as the advance guard of the Nahuatlan stock (q.v.), preceding the arrival of the Aztec by several centuries. Consult Valentini, *The Olmecas and the Tultecas* (Worcester, 1883).

TOLUCA, tô-lōō'kȧ. The capital of the State of Mexico, Mexico, thirty-four miles southwest of the city of that name, on the Mexican National Railroad (Map: Mexico, J 8). It is a clean, well-built city, with an altitude of 8653 feet and a cool and healthful climate. Its Institute and State buildings are interesting. The manufactories consist of breweries, cotton mills, and oil and flour mills. It is well known for its drawn work. In the vicinity is the extinct volcano Nevado de Toluca, a snow-capped peak 15,155 feet high. Tradition assigns the city a Toltec origin; it was an important Aztec pueblo called Tollân at the time of the Conquest. Population, in 1895, 23,150.

TOM, MOUNT. A mountain peak on the west bank of the Connecticut River, in Hampshire County, Mass., about five miles south of Northampton (Map: Massachusetts, B 3). It is 1214 feet high and affords a splendid view of the Connecticut Valley. Its summit is reached by a mountain railway.

TOMAHAWK (Algonquian *tomehagan*, Mohegan *tumnahegan*, Delaware *tamoihecan*, tomahawk; probably connected with Cree *otomahuk*, knock him down, *otâmahwaw*, he is knocked down). In general, the hatchet or axe made and used by the American natives. The aboriginal implement was usually of stone, either flaked and chipped, or battered and ground or polished. The former type was usually of flint or chert, with a constriction for holding the haft; the latter was commonly of green stone, granite, or other tough material, grooved to receive the haft. This haft was usually of wood. In rougher specimens it was merely a withe doubled or bent around the implement and firmly attached with sinew or rawhide, sometimes with the aid of a wedge, but in the more elaborate forms used in ceremonies and on the warpath it was carefully wrought of tough wood and attached to the head by means of sinew or rawhide lashings. Itself a symbol of war, the tomahawk usually bore some emblem of peace, and the highest type combined the weapon and the pipe, the distinctive American symbol of amity. This type culminated in the calumet (q.v.). The native type served as a model for a trade implement manufactured of metal and imported for barter with the natives, especially during the seventeenth century, which in its turn became the model for artists, and to some extent for the tribesmen themselves. The tomahawk grades into the celt (q.v.), and to some extent the implements were interchangeable; but while native copper was a not uncommon material for the latter implements, copper tomahawks are extremely rare. See INDIANS; ARCHÆOLOGY, AMERICAN.

TOMASZOW, tôm'ȧ-shôv. An important manufacturing town in the Government of Piotrkow, Russian Poland, 41 miles northeast of Piotrkow. It has extensive textile mills, with an annual output valued at over $3,000,000. Population, in 1897, 21,041, including many Germans and Jews. It dates from the early part of the nineteenth century.

TOMATO (Sp., Port. *tomate*, from Mexican *tomatl*, tomato), *Lycopersicum esculentum.* A semi-vine-like annual herb of the natural order Solanaceæ, native to South America in the region of the Andes. It was formerly called love apple and was considered poisonous. It is now widely cultivated in all temperate regions and considered one of the most wholesome and important garden vegetables. Near the large cities it is extensively forced. The numerous varieties vary much in form from the red currant forms to the small yellow pear-shaped varieties and the larger red sorts. The red sorts with smooth round fruits somewhat flattened at the ends and varying from 2 to 4 inches in diameter are most in cultivation. The tomato is propagated from seed and in greenhouses often by cuttings. In the temperate regions these are usually started in the greenhouse, hotbed, or cold frame, and the plants transferred to the field when the weather is warm and all danger from frost is past. The plants thrive best in a sandy soil, well fertilized. They are set in the field about five feet apart each way and in garden culture are often trained to stakes to keep the fruit off the ground. In the United States tomatoes are more largely grown for canning than any other vegetable. Over 5,500,000 cases of 24 cans each, requiring 300,000 acres of land for their production, are packed annually. Maryland, New Jersey, Indiana, and California are the leading States in production, the first two giving nearly one-half the entire pack. The bacterial blight (*Bacillus solanacearum*) attacks also the egg-plant and potato. The leaves become yellow, and the stems wilt and later become brown or black, the plant being destroyed. Spraying for the disease itself appears to have little effect, but preventing insect attack is thought to act as a check. The leaf blight (*Cladosporium fulvum*), often a more serious pest, appears as brownish spots on the under side of the leaves and yellow on the upper. As the disease progresses the leaves curl up and finally drop from the stem. A leaf-spot disease (*Septoria lycopersici*), sometimes troublesome, causes numerous spots to appear on the leaves and young stems, ultimately destroying them. Tomato rot is caused by various fungi, e.g. *Phytophthora infestans*, *Macrosporium tomato*, attacks the green fruits of the tomato usually at the blossom end and first shows as a small black spot, which increases rapidly until half the fruit is a soft, black, sunken mass. *Fusarium lycopersici* attacks the ripe fruit, covering it with a thick, white mold, which later becomes reddish. This disease is less common than the others. Repeated sprayings with Bordeaux mixture or other fungicide have been recommended as checks. Diseased fruits should be removed and burned. Consult Bailey, *The Forcing Book* (New York, 1898); *United States Department of Agriculture Farmers' Bulletin No. 76* (Washington, 1898). See Plate of VEGETABLES.

TOMATO INSECTS. Many of the insects that attack the tomato also live upon other members of the family Solanaceæ. Among the most common are blister-beetles, plant-lice, flea-beetles, and cutworms, descriptions of which will be found under their respective titles. Others are discussed under POTATO INSECTS; TOBACCO PESTS; STALK-BORER. The bollworm (q.v.) is sometimes seriously troublesome. See illustration under COTTON-INSECTS.

TOMB (OF. *tombe*, *tumbe*, Fr. *tombe*, from Lat. *tumba*, from Gk. τύμβος, *tymbos*, sepulchral mound, grave, tomb; connected with OIr. *tomm*, little hill, Skt. *tunga*, vaulted). A chamber or structure for the burial of the dead. In all ages the belief in immortality and the desire to honor the dead have led to the bestowal of the highest efforts of art upon their burial-places. The ancient belief in the intermediate, shadowy existence in the tomb of the *ka* or 'double' of the deceased led also to the decoration of the tomb interior with pictured or carved 'doubles' of the appurtenances of mundane life for the delectation of this imprisoned shade, as in the tombs of Egypt and Etruria.

Tombs may be either excavated or structural. Those cut in the rock are called *hypogæa.* Of these the most noted are those which honeycomb the west bank of the Nile in Egypt, some having roomy chambers with open porches in front; others, more numerous, penetrating deep into the cliffs (that of Seti I. extending 800 feet) with a complex of descending passages, chambers, and pits. Other rock-cut sepulchres are in the 'Valley of the Kings,' near Jerusalem; at Petra in Syria, where are Roman hypogæa with elaborately carved façades; the tomb of Darius at Naksh-i-Rustam in Persia; and many Etruscan tombs with less elaborate façades at Cære, Vulci, Corneto, etc. In Lycia, besides hypogæa with carved fronts, there are many tombs above ground hewn each from a single block into the semblance of a timber-framed structure. The splendid Sidon sarcophagi in the Constantinople Museum, shaped like small shrines or temples, almost deserve to be called tombs on account of their size and elaborate architecture. Intermediate between the rock-cut and structural tombs are such subterranean or buried structures as the hive-shaped Pelasgic tombs of Mycenæ, e.g. the so-called 'Treasury of Atreus.'

Structural tombs in the open air affect usually the type of a tumulus, of a shrine, of a tower, or of a canopy over a solid *podium* or pedestal. The Pyramids of Egypt are the grandest examples of the first type. (See PYRAMIDS.) The Romans sometimes built circular tombs surmounted by a cone or tumulus of earth or masonry; e.g. tombs of Cæcilia Metella, of Augustus, and of Hadrian; the last named on the Vatican side of the Tiber, over 200 feet in diameter, but like the others destitute of its mound, is now known as the Castle Sant' Angelo. The Greeks attempted little in the way of sepulchral architecture except in Asia Minor, where the magnificent tomb of Mausolus (whence 'Mausoleum,' q.v.) in Caria was accounted one of the Seven Wonders. The Romans, who delighted in raising impressive tombs, perfected the canopy or tower type, as in elegant examples at Saint-Remy and Vienne in France, Igel, near Treves, Mylassa in Asia Minor, and many other places. They lined their great highways beyond their city gates with tombs of various types and often of great beauty, and in the fourth century developed, in such examples as the tomb of Saint Helena, the circular tomb with a dome, which was in the Middle Ages adopted by the Moslems and perfected, first on a small scale but with great richness of detail, in the hundreds of domed and minareted tombs at Cairo known as tombs of the Khalifs, and later in such majestic structures as the tombs of Khurrem at Constantinople, of Humayun at Delhi, and of Mahmud at Bijapûr, and in the incomparable Taj Mahal (q.v.) at Agra. Syria abounds in tombs of all types, mostly dating from the early Christian centuries, though not a few belong to the Roman dominion, e.g. the 'Tomb of Absalom' at Jerusalem, the tombs at Palmyra, etc.

In early Christian times and the Middle Ages the practice of interment within the church edifice became common, springing from that of erecting the altar over the tomb or sarcophagus of a martyr (altar-tomb). Throughout the Middle Ages the decoration of indoor tombs assumed a great variety of shapes, the most common type being that of a sarcophagus bearing on the cover a recumbent figure of the deceased, under a richly wrought canopy borne by twisted shafts or clustered columns and pointed arches and embellished with sculpture and often with mosaic. These tombs were sometimes free-standing, sometimes set against a wall, or even set high up upon the wall, especially in Italy. Both kinds are to be seen imitated in the celeorated open-air tombs of the Scaligers at Verona. The bronze shrine of Saint Sebaldus at Nuremberg is a late Gothic example of the canopy tomb. The Renaissance adopted these types, but altered their details and filled the churches of Italy, France, England, Germany, and Spain with splendid monuments, some of great refinement and beauty, others marvelously rich and even ostentatious, to the memory of the great dead. The fifteenth-century wall-tombs of Italy are especially beautiful, and such churches as Santa Croce at Florence, Santi Giovanni e Paolo at Venice, Santa Maria del Popolo at Rome, and Westminster Abbey became great repositories of sepulchral art. Sculpture played an increasing part in these works, and in the seventeenth and eighteenth centuries was lavishly employed in allegorical groups, often theatrical and vulgar.

In modern cemeteries, besides the ordinary graves with their gravestones or obelisks, are to be seen tombs shaped like classic shrines, and occasionally more elaborate structures fronted or surmounted by elaborate groups of allegorical sculpture. Among important mausolea may be mentioned the impressive dome of the Invalides at Paris, serving as the tomb of the great Napoleon, and the less successful Grant mausoleum in New York. Neither of these compares in splendor, however, with the Oriental tombs mentioned above. Modern sepulchral art is inferior to mediæval, Renaissance, or Oriental art. The modern preference is to erect imposing monuments to the dead in the frequented squares of populous cities, rather than over their quiet graves in remote cemeteries. Consult: Brindley and Weatherly, *Ancient Sepulchral Monuments* (London, 1887); Tosi and Becchio, *Altars, Tabernacles, and Tombs* (Lagny, 1843); Trendall, *Monuments, Cenotaphs, Tombs, and Tablets* (London, 1858); Boussard, *Architecture funéraire* (Paris, 1875); and for Greek and Roman tombs, Stackelberg, *Die Gräber der Hellenen* (Berlin, 1837); Rossi, *Roma, sotteranea cristiana* (Rome, 1887-88). See Burial; Campo Santo; Cemetery; Cenotaph; Necropolis; Pyramid; Sepulchral Mound.

TOMBAC (Fr. *tombac*, Sp. *tumbaga*, Port. *tambaca, tambaque*, from Malay *tāmbaga, tambaga*, copper, from Skt. *tāmrika, tāmra*, copper). An alloy of copper and zinc. *White tombac* contains about 75 parts of copper and 25 parts of arsenic. It is used in making imitation jewelry.

TOMBIG′BEE. One of the chief rivers of Alabama (Map: Alabama, A 3). It rises in the northeastern corner of Mississippi and flows in a south-southeast direction with numerous abrupt windings. After a course of 450 miles it joins the Alabama River to form the network of channels composing the Mobile and Tensas, which empty through several arms into Mobile Bay. The largest tributary is the Black Warrior, which drains the north central part of Alabama. The Tombigbee is navigable to Aberdeen, Miss., 410 miles from Mobile Bay.

TOM BROWN'S SCHOOL DAYS. A noted story of life at the famous Rugby School under the rule of Thomas Arnold, by Thomas Hughes (1856). The vein was continued in *Tom Brown at Oxford*, by the same author (1861).

TOMBS, The. A noted city prison in New York, erected in 1838, and so named from its massive and gloomy appearance. The low Egyptian structure of granite has been replaced by a modern edifice of greater height. It is connected with the new Criminal Courts by a covered passage known as the Bridge of Sighs.

TOMBS, Sir Henry (1824-74). An English soldier, born at sea and educated at the India Company's Military College at Addiscomb. In 1841 he entered the service of the East India Company as second lieutenant and soon distinguished himself. In the Sepoy Mutiny he won the Victoria Cross by his gallant conduct at the siege of Delhi in 1857. Afterwards he took part in the capture of Lucknow, the relief of Shahjahanpur, and in an expedition to Shakabad. In 1863 he was made brigadier-general and in 1867 major-general. During his later years he was in command of several important expeditions in India, but in 1872 resigned his command and returned to England, where he died. Consult: Mallerson, *History of the Indian Mutiny* (London, 1878-80); Stubbs, *History of the Bengal Artillery* (London, 1877); and Roberts, *Forty-one Years in India* (London, 1898).

TOMCOD (probably from North American Indian *tacaud*, plenty-fish, or perhaps from *tom* + *cod*). One of the small codfish of the genus Microgadus, as *Microgadus tomcodus* of the Atlantic Coast, or *Microgadus proximus* of the Pacific. They are very abundant and of considerable importance as food. See Plate of Codfish and Allies.

TOM CRINGLE'S LOG. A sea yarn by Michael Scott, which first appeared in *Blackwood's Magazine*. The hero, as an officer of the British Navy, in the early part of the nineteenth century, passes through many adventures by sea and land, principally in the West Indies. As a picture of West Indian life in the old days and for descriptions of tropical scenery it has no equal in the English language.

TOME, tō-mā′. A modern seaport of the Province of Concepción, Chile, 12 miles north of the city of that name. It has made notable commercial progress and is now the principal grain port of the surrounding provinces. Municipal population, in 1885, 5530.

TOME INSTITUTE. See Jacob Tome Institute.

TOMELLOSO, tō′mĕl-yō′sō. A town in the Province of Ciudad Real (La Mancha), Spain, in the district of Alcázar de San Juan. The town dates from the sixteenth century and is well built. The chief industry is the cultivation of the vine and of cereals, and there are manufactures of spirits, leather goods, and cloths. Population, in 1900, 13,917.

TOM JONES. A noted novel by Henry Fielding (1749). The hero is a foundling, eventually discovered to be the illegitimate nephew of Squire Allworthy, who brings him up. He has a generous and manly character, spoiled by various forms of dissipation.

TOM′LINE, Sir George Pretyman (1750-1827). An English divine, Pretyman by name, who assumed the cognomen of Tomline on falling heir to an estate in 1803. He was born at Bury Saint Edmunds and was educated in that town and at Pembroke Hall, Cambridge, where he formed the acquaintance of the younger Pitt—as his tutor in 1773—which was the making of his own career. In 1783 he became private secretary to Pitt, when that statesman was made First Lord of the Treasury. In that position his mathematical ability enabled him to be of considerable service to his patron in the elaboration of the latter's financial schemes. Tomline was made Dean of Saint Paul's and Bishop of Lincoln in 1787, and was awarded the see of Winchester in 1820. In the following year appeared his memoir of Pitt. This work, although accurate as far as it went, was disappointing in that it took no notice of Pitt's career after 1793 and made scant use of the unique opportunities which the writer had enjoyed for acquaintance with the inner history of the time.

TOM'LINSON, Charles (1808-97). An English scientist, born in London. He studied science under George Birkbeck, the founder of the London Mechanics' Institute. For a while he had a school with his brother Lewis, at Salisbury. Becoming known for original investigation, he was called to London, where he was appointed lecturer on experimental science at King's College School. In 1872 he was elected to the Royal Society, and in 1874 he took a leading part in founding the Physical Society. As a scientist Tomlinson made valuable contributions to the knowledge of the surface tension of liquids. His last years were devoted to literature, and in 1878-80 he held the Dante lectureship at University College, London. Besides several works on mechanics and the useful arts, he published: *The Sonnet, Its Origin, Structure, and Place in Poetry* (1874); a translation of Dante's *Inferno* (1877); *The Literary History of the Divine Comedy* (1879); *Dante, Beatrice, and the Divine Comedy* (1894); and a volume of original *Sonnets* (1881).

TOMMASEO, tŏ'mȧ-zā'ō, Niccolò (1802-74). An Italian author and lexicographer, born at Sebenico, in Dalmatia. He went to Padua to study law, but turned to literature. In Florence he collaborated on Viessieux's *Antologia.* The Government suppressed the *Antologia* in 1832, and Tommaseo, having to leave Florence, sought refuge in Paris, where he endeavored to make the French better acquainted with his countrymen, through various writings, especially *Dell' Italia* (1835). In 1838 he took up his abode in Corsica, and there made a collection of popular songs, *Canti popolari corsi, toscani, greci e illirici* (1841). He returned to Venice, where he was permitted to stay from 1839 to 1848. In January, 1848, he was arrested because of his liberal opinions, but a popular insurrection freed him. After the fall of Venice in 1849 he went to Corfù, going thence in 1854 to Turin, where he began the publishing of his great *Dizionario della lingua italiana.* He passed his last days in Florence.

The multitudinous works of Tommaseo are all mentioned in the excellent account of him given in vol. v. of d'Ancona and Bacci's *Manuale della letteratura italiana* (Florence, 1895). They embrace religious writings, moral and pedagogical treatises, political essays, philological, literary, and critical works, poems, and ballads; and they all reveal the qualities of the ardent patriot and citizen, of the fervent and tolerant Catholic, and of the clear-thinking and indefatigable scholar.

TOMMASI, tôm-mä'zė, Donato (1848—). An Italian chemist and electrician, born in Naples and educated at Paris and at the University of Brussels. His specialty is electrochemistry, a branch of science in which he made valuable investigations. His discoveries include various methods for separating and extracting metals by electricity (1892), and an accumulator which has been much used on railways. His publications include: *Traité théorique et pratique d'électrochimie* (1889); *Traité des piles électriques et des accumulateurs* (1890); and *Manuel pratique de galvanoplastie* (1890).

TOMMY ATKINS. The popular name for a private soldier in the British army. It had its origin in the Government usage of the fictitious name of Thomas Atkins to designate the place of the soldier's signature in such documents and army forms as were to be signed by him.

TOMOCHICHI, tō'mô-chē̆'chė (one who makes a bird fly upward) (c.1642-1739). A noted chief of the Yamacraw, a detached band of the Creek Confederacy, in the early period of Georgia colonization. He was a native of the Lower Creek town of Apalachukla, on the Alabama side of the Chattahoochee, nearly opposite the present Columbus, Ga. For some reason he had incurred the displeasure of the confederacy and in consequence withdrew with his immediate followers and established himself on the Savannah River at Yamacraw Bluff, now a part of Savannah. Here he concluded a treaty of friendship with Governor Oglethorpe, and through his influence a treaty was made in 1733, at Savannah, with the Lower Creeks, by which the latter ceded all their claims from the Savannah to the Altamaha. In the next year, with a considerable retinue, he accompanied Oglethorpe to England. A monument to him was erected in Savannah.

TOMP'KINS, Daniel D. (1774-1825). An American political leader, Vice-President of the United States from 1817 to 1825. He was born in Fox Meadows (Scarsdale), Westchester County, N. Y., graduated at Columbia in 1795, and in 1797 was admitted to the bar. In 1804 he was elected to Congress, but before taking his seat was appointed by Governor Morgan Lewis to the vacancy on the State Supreme bench caused by the promotion of Judge Kent to the Chief Justiceship. In 1807 he became the candidate of the Clintonian Republicans for Governor to succeed Morgan Lewis, who had been renominated by the Livingston party with strong Federalist support. He was elected over Governor Lewis by 4085 majority, and was reëlected four times, serving altogether ten years. During his third term an attempt to secure a charter from New York State for the Bank of America was accompanied by a wholesale bribing of the State Legislature. After the Lower House had sanctioned the charter, on March 27, 1812, Governor Tompkins prorogued both Houses—a power granted by the Constitution, but never before nor since exercised. The charter was granted at the next session of the Legislature, but Governor Tompkins's action had increased his popularity. During the War of 1812 Governor Tompkins recruited and equipped 40,000 militia in New York State. For these purposes he provided funds raised partly on his personal security. It was on his recommendation made in his last message to the Legislature in January, 1817, that the New York Legislature passed a law decreeing that all slaves should be free on and after July 4, 1827. Throughout both of Monroe's terms in the Presidency (1817-25) Tompkins was Vice-President of the United States.

TOMP'SON, BENJAMIN (1642-1714). An early American poet, born at Braintree, Mass. He was educated at Harvard College and became a school teacher in Cambridge. He is known by his poem on King Philip's War, *New England's Crisis* (1675).

TOM'S. A former London coffee-house in Covent Garden, a fashionable resort, and the headquarters of a club founded in 1764, which among its 700 members included many noted names of the day. Tom's was taken down in 1865.

TOMSK, tômsk. A government of Western Siberia, bounded by Tobolsk and Yeniseisk on the northwest and the northeast, respectively, Yeniseisk and the Chinese Empire (Mongolia and Sungaria) on the east, the Territory of Semipalatinsk on the south, and Tobolsk on the west (Map: Asia, H 3). Area, about 331,159 square miles. The southern and southeastern parts belong to the region of the Altai Mountains, and contain many snow-clad peaks, some of them 11,000 feet high. The Kuznetzky Alatau, along the eastern frontier, is densely wooded and rises to about 6000 feet. The remainder of the region is mostly low and consists of vast densely wooded marshes and open steppes. The region is watered mainly by the Obi (q.v.) and its tributaries, including the Irtysh (q.v.). Lakes are numerous and some of them are salty. The climate is severe and unhealthful in the lowlands. In spite of the abundance of the mineral deposits of the Altai Mountains, the mining industry is poorly developed. Agriculture is the principal occupation and the output of cereals is far above the local demand. Stock-raising is also an extensive industry. Manufactures are undeveloped, but the trade with Mongolia is on the increase and there is considerable navigation on the Obi. The trade with European Russia also shows an increase since the construction of the Trans-Siberian Railway. Population, in 1897, 1,929,092, of whom the natives (Tatars, Samoyeds, Ostiaks, etc.) numbered only about 67,500, the remainder being Russians. The immigration to Tomsk has latterly been very heavy. The number of immigrants for the decade 1888-98 was over 227,000.

TOMSK. The capital of the Siberian Government of Tomsk and the intellectual centre of Siberia, situated on the Tom, a tributary of the Obi, and connected by a short line of 54 miles with the Trans-Siberian Railway (Map: Asia, H 3). It is one of the finest cities of Siberia, with electric lighting and street railways, but without an adequate water supply and unsatisfactory in its sanitary arrangements. The university, established in 1888, has two faculties of medicine and law, 540 students, and a library of 200,000 volumes. The commerce is very extensive, Tomsk being one of the chief distributing centres of Siberia. The town was founded in 1604. Population, in 1900, 63,335.

TOMS RIVER. The county-seat of Ocean County, N. J., 35 miles southeast of Trenton; on Toms River and on the Pennsylvania Railroad and the Central Railroad of New Jersey (Map: New Jersey, D 4). It is known as a summer resort. Farming, especially the cultivation of cranberries, fishing and oyster planting, lumbering, and yacht-building are the leading industries. Population, in 1900, about 1850. Early in the Revolutionary War important salt works were established here, and a small blockhouse was built to protect them. On March 24, 1782, this blockhouse, then occupied by Captain Joshua Huddy and 25 men, was attacked by a much larger force of Loyalists under Captain Evan Thomas and Lieutenant Owen Roberts, and was captured after a stubborn conflict. Immediately afterwards the village itself was totally destroyed. Consult a pamphlet by Striker, *The Capture of the Old Blockhouse at Toms River, New Jersey* (Trenton, 1883).

TOM THUMB. See STRATTON, CHARLES SHERWOOD.

TOM-TOM. See TAM-TAM.

TON. See WEIGHTS AND MEASURES.

TONALITY (from *tonal*, from *tone*, OF. *ton*, from Lat. *tonus*, from Gk. *τόνος*, tone, sound, tension, strength, cord, from *τείνειν*, *teinein*, Lat. *tendere*, Skt. *tan*, to stretch). In music, the grouping of certain *chords* around a central *tonic chord*. The principle rests upon the relationship which various chords bear to one another. Briefly stated, a tone is related in the first degree to all tones forming consonant intervals with it; in the second degree to all tones forming *dissonant* intervals with it. Thus we can establish the relationship of D to C by means of the chord of the dominant seventh d-f♯-a-c, which is the dominant of G major, which, in turn, is the dominant of C major.

The relationship of single tones becomes intelligible only through the agency of chords. It is sufficient to recognize only two degrees. Since, when considering the relationship of chords, each chord is considered a *tonic* chord, it will perhaps be best to speak of *triads*. A sharp distinction must be made between *similar* and *dissimilar* triads. If a major triad is followed by another major, or a minor triad by another minor, the two major triads are similar; as are also the two minor triads. But if a major triad is followed by a minor, or vice versa, the two triads are dissimilar. It must also be borne in mind that when speaking of *major* triads all intervals are reckoned *upward;* when speaking of *minor* triads all intervals are reckoned *downward.* A triad is related in the first degree to all *similar* triads whose fundamental tone is related in the first degree to the fundamental tone of the original triad. Thus the triad of C major is related in the first degree to the similar *major triads* of G, F, E, A♭, E♭, A. It is also related in the first degree to the dissimilar *minor triads* whose fundamental lies a fifth below any of the tones of this C major triad. These are F, A, C, a fifth below C, E, G, respectively. To these must also be added the triad built upon the mediant, which in a *major* key is always a *minor* triad. Hence, every triad is related to ten other triads in the first degree. In the case of a minor triad similar relations exist. The triad of A minor is related to the *similar minor triads* of D, E, F, C♯, F♯, C; also to all *dissimilar major* triads whose fundamental tone is one of the component tones of the A minor triad, viz. A, C, E. To these is also added the triad of the mediant, which in a *minor* key is always a *major* triad.

All triads other than the ten just mentioned are related to the original triad in the second degree. Here the degree of affinity may be more or less remote. See CHORD; CONSONANCE; DISSONANCE; KEY. For a full exposition of the subject, consult: H. Riemann, *Musikalische Syntaxis* (Leipzig, 1877); *Skizze einer neuen Methode der Harmonielehre* (ib., 1880); *Systematische Modulationslehre* (ib., 1887).

TON'AWAN'DA. A city in Erie County, N. Y., about 10 miles north of Buffalo; on the Niagara River and the Erie Canal, and on the New York Central and Hudson River and the Erie railroads (Map: New York, B 3). It is connected with North Tonawanda by two bridges. The prominent features of the city include the armory, the high school, the public library, and a park. Tonawanda is an important lumber market, and is also interested in manufacturing, the chief products being steel, lumber, and paper boards. The government, under the charter of 1903, is vested in a mayor, chosen biennially, and a unicameral council. The water-works are owned and operated by the municipality. Population, in 1890, 7145; in 1900, 7421.

TONE. In music, the name given to the larger intervals in the diatonic scale, so called in contradistinction to the *semitones* (q.v.), or smaller intervals. Theoretically, some of the intervals called tones are larger than others, and none of them are equal to two semitones; thus, in the scale of C, the intervals CD, FG, and AB are all equal; but DE and GA, which are also called tones, are smaller; and the semitones, EF and BC, are larger than half even of the larger tones. In instruments, however, which are tuned according to the equal temperament (q.v.), all the tones are made equal, and each equivalent to two semitones.

TONE, THEOBALD WOLFE (1763-98). An Irish revolutionist. He was born in Dublin, where he was educated, graduating at Trinity College. He was called to the Irish bar in 1789. He was one of the founders of the first club of United Irishmen at Belfast, and similar organizations in other parts of Ireland and agent of the Roman Catholic committee, 1792; was implicated in Jackson's treasonable designs with the French Government in 1794, but was allowed to go to the United States in 1795. In the following year, however, he went to France for assistance, and returned suddenly to Ireland, recalled by rumors of a revolt. In the expedition to Bantry Bay he was adjutant-general to the commander Hoche, but the fleet was driven off the coast and scattered. In 1798 he again set sail for Ireland with a small French expedition, and was captured by an English fleet off Lough Swilly. Having been sentenced to be hanged, he cut his throat with a penknife, dying a few days later. Consult: *The Life of Theobald Wolfe Tone, etc., with his Political Writings*, edited by his son, William Theobald Wolfe Tone (2 vols., Washington, 1826).

TONE COLOR. In music, the quality of the tone of musical instruments or of the human voice. See the article CLANG TINT, EXPLANATION OF.

TO'NER, JOSEPH MEREDITH (1825-96). An American physician, born in Pittsburg, Pa., and educated at Mount Saint Mary's College, the Vermont Medical College, and the Jefferson Medical College. He graduated at Jefferson Medical College in 1853 and two years afterwards settled in Washington, D. C., where he founded the Providence Hospital and became identified with several other similar institutions. In 1868 a resolution which he had offered was adopted by the American Medical Association, providing for the collecting of American medical literature. In 1871 he gave the fund which established the well-known Toner lectures. He was president of the American Medical Association in 1873, of the American Health Association in 1874, and was vice-president of the International Medical Congress of 1887. He was an indefatigable collector of books and pamphlets on medical subjects, and in 1882 presented his valuable library to the Government. His publications include: *Maternal Instinct* (1864); *Compulsory Vaccination* (1865); *Annals of Medical Progress and Medical Education in the United States* (1874); *Medical Men of the Revolution* (1876).

TON'GA ISLANDS, or FRIENDLY ISLANDS. A group of Polynesian islands in the Pacific Ocean, about 350 miles southeast of Samoa, extending from 18° 5′ to 22° 29′ south latitude and from 173° 52′ to 176° 10′ west longitude, the Fiji Islands being on the east (Map: Australasia, L 4). The Tonga Islands form a native kingdom, but are controlled by Great Britain. They number about 150, but only 32 are of any importance. The area is about 390 square miles. The Tonga Islands form two nearly parallel rows of islands extending from north to south. The eastern row contains the Vavau, Haapai, Namuka, Kotu, and Tonga groups. These eastern islands are of coral limestone formation, and lie low and are comparatively level. In the last-named group is the largest and most fertile island of all—Tongatabu. It is in the south, and contains about 140 square miles. It has about half the population of all the Tonga Islands. The western row of islands are volcanic, high and steep. Of these, Lette and Tofoa are active, and Kao (about 2850 feet high) is extinct. The climate of the Tonga Islands is moderate and favorable, considering the latitude. The annual rainfall is heavy—over 75 inches. Serious earthquakes are not infrequent, and small islands rise suddenly at times and as suddenly disappear. A tornado wrought havoc in Vavau in 1900. The flora is very rich, especially in palms. The native fauna is comparatively insignificant; there only needs to be mentioned the large bat (*Pteropus tonganus*). All the main Tonga Islands are covered with luxuriant vegetation. The soil is rich. The land is leased, not sold; and as its tenure is not assured, the improvements are both meagre and poor. Copra and fungus are exported, and tapa and mats are made. The imports, mostly from Australia and New Zealand, amounted to $440,000 in 1901, and include draperies and foods. The tonnage entered and cleared in 1901 was 119,100. There is regular steam communication with the neighboring British possessions. There are many good harbors. The annual revenue is about $100,000, the expenditure somewhat less. There is no debt. The capital is Nukualofa, on Tongatabu Island. The population was given in 1900 as 18,959, nearly all natives. They are among the most civilized of the Polynesians. They are agriculturists and adept seafarers. While clever and eager to learn and imitate, they appear to lack the qualities necessary to independent and enduring success. Most of them are Wesleyans.

The Tonga Islands were discovered in 1643. In 1773 and in 1777 they were visited by Cook, who explored them, and gave them the name of Friendly Islands on account of the friendly attitude of the natives. Before the breaking out of the civil wars early in the nineteenth century, the islands were under the rule of two reigning families. During this political upheaval the local hereditary chiefs declared their independence, but were united under the wise rule of George I., who in 1875 introduced a sort of constitutional government, allowing the chiefs a share in the administration. Treaties were concluded with Great Britain, Germany, and also, in 1888, with the United States. The privilege of building a naval station was abandoned by Germany in 1899 in favor of Great Britain, which country declared its protectorate over the group in that year. The present ruler, King George II., is assisted by a legislative assembly, meeting every three years, and composed partly of hereditary nobles and partly of members elected on a property qualification. There are a cabinet, a privy council, and judiciary.

Bibliography. Ellis, *Polynesian Researches* (London, 1853); Erskine, *Islands of the Western Pacific* (London, 1853); Fornander, *An Account of the Polynesian Race* (ib., 1878); Coote, *Western Pacific Islands* (ib., 1883); Cooper, *The Islands of the Pacific* (ib., 1888); Reclus, *Nouvelle géographie universelle,* vol. xiv. (Paris, 1889); Monfat, *Les Tonga ou Archipel des Amis* (Lyon, 1893); Wallace, "Australasia," in Stanford, *Compendium of Geography* (London, 1894); Reeves, *Brown Men and Women in the South Sea Islands* (ib., 1898); Shoemaker, *Islands of the Southern Seas* (New York, 1898); Stevenson, *In the South Seas* (London, 1900); Brigham, *An Index to the Islands of the Pacific* (Honolulu, 1900).

TON'GALAND, or **AMATONGALAND.** A district of Zululand, and accordingly of Natal, in Southeast Africa, bounded on the north by Lourenço Marquez, on the east by the Indian Ocean, on the south by Zululand, and on the west by the Vryheid district and Swaziland (Map: Cape Colony, P 4). It thus forms the northern neck of Zululand. Area, 1280 square miles. The Lebombo Mountains border it on the west. The Pongola River traverses the country from south to north, just west of the centre, the Kosi River, flowing in a general eastern direction, is in the south, and Lake Kosi—a lagoon—forms an inlet from the ocean on the east. The country is generally level and low. The climate is very unhealthful. The inhabitants are Zulu-Kafirs—the Amatonga. No figures for the population are given. The possession of Tongaland was strongly desired by the Boers, since it would have furnished them an outlet to the sea and a haven. Great Britain was eager to frustrate their plans, however, and declared Tongaland under British protection in 1895. It was annexed to Zululand (q.v.) December 27, 1897. This action embraced also the small possessions of the Sambana and Umtegiza chiefs, which formed the narrow portion of Tongaland west of the Pongola River. Zululand, including Tongaland, was annexed to Natal December 30, 1897.

TONG-HAK, tông-häk′ (Sinico-Korean, Oriental culture). The watchword of a revolutionary party in Korea founded in 1859 by a native Korean scholar named Choi, who fused together the elements of the three systems of Confucius, Buddha, and Lao-tse. In 1865 he was branded as a 'foreigner Korean,' and beheaded, and his followers were persecuted, but still increased. In 1893 a delegation of 50 of them went to Seoul and petitioned for the rehabilitation of Choi. They were driven away, but in the succeeding spring occurred the Tong-Hak uprising that led indirectly to the Chino-Japanese war of 1894, the independence of Korea, and the Russian aggressiveness in Manchuria. See Korea.

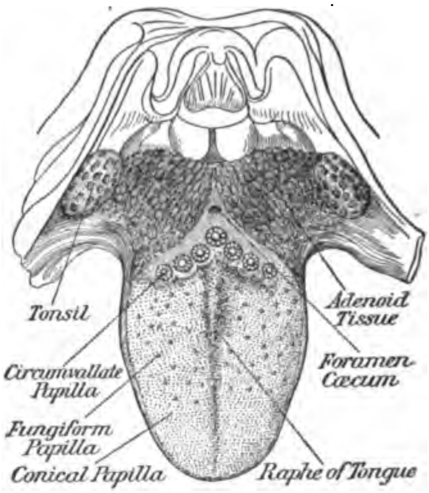
TONGKING′, or **TONQUIN,** tŏn′kēn′, *Fr. pron.* tôn′kăn′. A French protectorate in French Indo-China (q.v.), situated just south of the Tropic of Cancer, in Southeastern Asia, bordered by China on the north, the Gulf of Tongking on the east, Annam, Laos, and Siam on the south and southwest, and Laos on the west (Map: French Indo-China, E 2). Area, estimated at 46,400 square miles. Tongking has a heavily forested plateau in the north. The eastern part is tilled, and contains slate and limestone. The protectorate is traversed in a southeasterly direction by the navigable Red River (q.v.) or Song-Koi, its delta district covering some 5000 square miles. This district, together with the neighboring islands, affords coal (kebao) and fishing. Other minerals of the protectorate are iron, copper, and gold. The climate is hot and humid. Storms are frequent in summer. The temperature ranges from 61.7° to 84° F. The soil is of great fertility. The flora in the southwest resembles that of India; that of the northeast is akin to that of Southern China. Nuts and tropical fruits abound.

France is making strong endeavors to colonize the protectorate. The cattle industry is prominent. Opium, cacao, sugar, tea, cotton, corn, coffee, and tobacco promise to be extensively cultivated. Rice, the staple crop, equals the best in the world. Furniture, glass, silk, cotton, indigo, paper, oil, and sugar are manufactured. The commerce has rapidly increased. The imports consist largely of machinery, metals, and textiles. The main exports are rice and animal products. The transit and the coast trade are extensive. The leading commercial points are Haiphong (the chief port, possessing a fine harbor) Kwang-yen, and Nam Dinh. A railroad extends from the last point to Hanoi, and thence northeast to Lungchow. The Red River Valley railroad to Yunnan and the coast line to Hué are in course of construction. There are ocean cables to Hué and Hong Kong. The largest city is Hanoi, the seat of the resident superior of Tongking, as well as of the Governor-General of French Indo-China. (For government, see French Indo-China.) There are fourteen provinces. The budget in 1902 balanced at $851,200. See Hanoi.

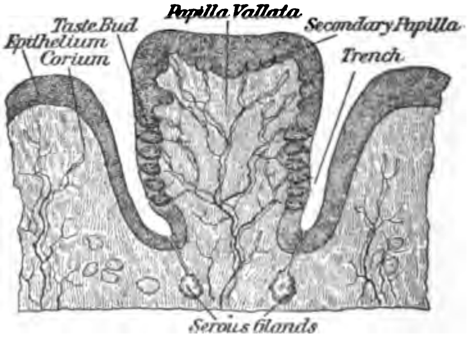
The population of Tongking is estimated at 7,000,000. The race is Annamese. Besides these, who dwell largely in the delta region, and who are taller and darker than their kindred in Cochin-China and Annam, the interior contains a number of more or less primitive peoples, such as the Thos (q.v.) of the Claire River basin, the Muongs (q.v.) of the Black River valley, and others who belong to the Thai (q.v.). The Chinese number upward of 35,000. Several hundred thousand of the inhabitants profess Catholicism. Tongking was an independent State before it came under the control of Annam in 1802. In 1873 the first military expedition of the French was sent into the territory, but by agreement the next year they retired. In 1882 the French Government, having conceived the design of securing the delta of the Red River for French commerce, sent an expedition against the predatory Black Flags, a Chinese soldiery, representing a remnant of the Taiping rebels. The French sailed up the Red River and occupied the citadel of Hanoi. Annam lent her support to the Black Flags, whereupon in August, 1883, the French fleet under Courbet bombarded Hué and compelled Annam to accept a French protectorate and to allow France to prosecute her designs with regard to Tongking. The French pushed their operations with success, but soon had to face a war with China, to whose suzerainty Annam was still nominally subject. This conflict, which lasted a year (1884-85), left France in virtual possession of Tongking. In 1887 Tongking was made a part of French Indo-China. Consult: Imbert, *Le Tonkin industriel et commercial* (Paris, 1885); Millot, *Le Tonkin* (ib., 1888); Petit, *Le Tonkin* (ib., 1892); Mat Gioi, *Le Tonkin actuel 1870-90* (ib., 1891); Pinabel, *Sur quelques peuples sauvages dépendants du Tonkin* (ib., 1884); Holquard, *Une campagne au Tonkin* (ib., 1892).

TONGKING, GULF OF. An arm of the China Sea extending northward between French Indo-China on the west and the Chinese island of Hainan together with a peninsula of the Province of Kwang-tung on the east (Map: China, C 8). It is 150 miles wide and 300 miles long, and receives the Red River. Its depth is everywhere less than 300 feet.

TONGUE (AS. *tunge*, Goth. *tuggō*, OHG. *zunga*, Ger. *Zunge*, tongue; connected with OLat. *dingua*, Lat. *lingua*, tongue). A symmetrical muscular organ, extending from the hyoid bone forward and downward, to the lips in front, and occupying the buccal cavity. The superior surface, borders, and anterior third of the inferior surface are free; while the remaining parts are attached to adjacent parts by the investing mucous membrane and subjacent structures. At certain points this membrane, on leaving the tongue, forms distinct folds, containing fibrous or muscular tissue, which act to a certain extent as ligaments of the tongue. The most considerable of these folds is termed the *frænum* (or bridle) of the tongue, and connects its anterior free extremity with the lower jaw. It acts as a strong ligament, and limits the backward movement of the tip of the tongue. In rare cases this ligament extends abnormally to the tip, so as to interfere with speech and mastication, and the child is said to be *tongue-tied;* recourse must be then had to division of the frænum, popularly known as *cutting the tongue.* Other folds of mucous membrane (the *glosso-epiglottid folds*) pass from the base of the tongue to the epiglottis; while from the sides of the base, passing to the soft palate, are seen two folds on either side, known as the *pillars of the fauces.* (See PALATE). The *superior surface* of the tongue is divided into two symmetrical lateral parts by a median longitudinal furrow beginning at the tip, and extending back about two-thirds of the tongue's length. The various kinds of papillæ which are seen on their surface are described in the article TASTE. At the back of the surface, just behind the circumvallate papillæ, are large mucous glands, extending into long and capacious canals, and helping to secrete the fluid that moistens the tongue. On the *inferior surface,* the longitudinal furrow, which extends from the tip to the frænum, is deeper than on the upper surface; on each side of it veins are seen running forward; and immediately beneath the tip is a cluster of mucous glands, known as the glands of Nuck (their discoverer in 1690). The *posterior extremity,* or *base,* is flattened and extended laterally before it is inserted into the *hyoid bone* (known also as the *lingual* or *tongue bone*), which, with certain ligaments, must be regarded as the basis or framework of the tongue. The muscles of the tongue are usually divided into

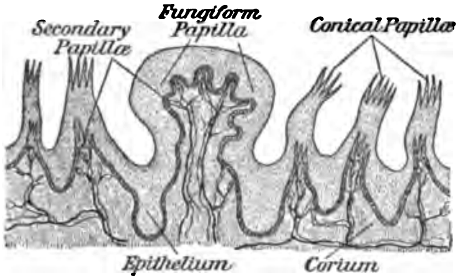


HUMAN TONGUE.

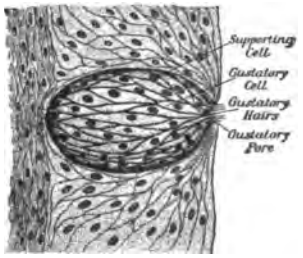


SECTION THROUGH A PAPILLA VALLATA.

two groups—viz. the *extrinsic* muscles, which attach the tongue to certain fixed points external to it, and move it on them, and the *intrinsic* muscles, which pass from one part of the tongue to another, constitute its chief bulk, and move it on itself. These intrinsic muscular fibres run vertically, transversely, and longitudinally, and are so interlaced as mutually to support one another, and to act with the greatest advantage. By the action of the various muscles, the upper surface of the tongue may be made concave or convex, or may be pressed against the roof of the mouth; the tip may be protruded straight out or laterally, upward and downward, and to any recess (as for instance, a hollow tooth) within the mouth where food might lodge; and the whole organ may be drawn back. The nerve supply to the tongue is motor and sensory. The motor nerve is the hypoglossal. The sensory nerves are the lingual (or gustatory) branch of the fifth, which confers sensibility on the mucous membrane of the anterior two-thirds of the tongue; the lingual branch of the glosso-pharyngeal, which confers ordinary sensibility and the sense of taste on the posterior third of the tongue; the chorda tympani, which is the special nerve of taste for the anterior two-thirds of the tongue.



SECTION SHOWING STRUCTURE AND ARRANGEMENT OF PAPILLÆ.



VERTICAL SECTION THROUGH A TASTE BUD.

The functions of the tongue are gustation, prehension (in man and monkeys this function is supplied by the hand), mastication, insalivation, deglutition, and speech; to which may be added spitting and whistling, and in the case of the Gasteropoda, trituration of the food.

The tongue is subject to several diseases, among which may be mentioned: *Glossitis*, or inflammation of the tongue, tuberculosis, and syphilis; new growths, usually malignant in nature; certain affections which the mucous membrane of the tongue shares with the skin, such as herpes, lichen, and leucopathia. It is also subject to excoriations, ulcers, and fissures. *Macro-glossia* is a term applied to certain chronically enlarged conditions of the tongue. It is a condition often found in cretins and is probably due in this case to alymphangioma.

Hypertrophy and also *cancer* may attack the tongue.

TON'IC (from Gk. *τονικός*, *tonikos*, relating to tone, from *τόνος*, *tonos*, tone, sound, tension, strength, cord). A medicine which acts upon the nutrition of the various tissues so as to restore lost tone, not by increasing their contractility, but by increasing their power. They are to a certain degree stimulant, but their effect is more permanent, and without producing excitation or elation. They do not rouse forces existing, but by increasing nutrition increase power. Most tonics act primarily through the nervous system, their effects upon the muscular system being secondary. They are of special value during convalescence, but are useless, if not harmful, during inflammatory reaction. Among the tonics in the *materia medica* are the *simple bitters*, including quassia, simaruba, gentian, nectandra, barberry, calumba, boneset, goldthread, centaury, dogwood, and salicin; the *peculiar bitters*, including wild cherry, cinchona, quinine, and picric acid; the *aromatic bitters*, including chamomile, snakeroot, cascarilla, and angostura; the *true aromatics*, including cinnamon, clove, nutmeg, allspice, cardamom, ginger, black pepper, red pepper, cajeput, and eucalyptus; and the *mineral tonics*, including iron, sulphuric acid, muriatic acid, nitric acid, nitromuriatic acid, lactic acid, and phosphorus. Most of these drugs are considered under their own titles. Digestive power is increased principally by the bitters, the aromatics, and the acids. Nutrition is improved especially by iron. Besides drugs, baths and massage are valuable adjutants in acquiring strength and vigor. Shower baths, cold sponge baths, sea bathing, and out-of-door exercise are very decided tonics.

TONIC, or KEYNOTE. In music, the note which forms the basis of any scale or key, and on which a piece of music written in that key naturally closes. The tendency of modern harmony is to conceive the tonic not as a single tone, but as a triad built upon that tone. See KEY; TONALITY.

TONICA, tō-nē'kȧ, or **TUNICA**. A peculiar tribe, constituting a distinct linguistic stock, who lived, when first known to the French, about 1700, on the Lower Yazoo River in Mississippi, near its junction with the Mississippi, where a mission was established among them. Probably at an earlier period they had lived at the Tunica Old Fields in the county bearing their name in the northwestern corner of the same State. They made a close alliance with the French, but were hostile to most of their Indian neighbors, particularly the Chickasaw, and in 1706 nearly exterminated the Huma in a massacre near New Orleans. Subsequently they removed to a location on the east bank of the Mississippi, about opposite Pointe Coupée, below Red River, where they still lived in 1802, having then 120 men. In 1817 they were settled about 90 miles up Red River, where the remnant, of about 25 persons, was found near Marksville, Louisiana, in 1886 by Gatschet, who obtained the first vocabulary of their language.

TONIC SOL-FA. Various attempts have been made at different times to introduce a musical notation in which the staff with its lines and spaces is dispensed with. Jean Jacques Rousseau suggested, but afterwards discarded, a notation where the notes of the scale were indicated by the Arabic numerals. A system similar to Rousseau's in its leading features, called the tonic sol-fa, has, through the influence of its principal promoter, the Rev. John Curwen (who obtained his main principles from the writings and practice of Miss Glover of Norwich), been brought into use to a considerable extent in singing schools in England. It proceeds on the principle of giving the chief prominence to the fact that there is in reality but one scale in music, which is raised or lowered according to the pitch of the key. This method is a revival of the old solmization system invented by Guido d'Arezzo. It admits, however, the interval of the seventh, strictly excluded by Guido. For the complicated music of modern masters the tonic sol-fa is as inadequate as the solmization system of Guido had been found. It also favors the system of unequal temperament, and this is directly opposed to the fundamental principle of equal temperament, without which the achievements of modern music would have been impossible. It is, however, of undoubted value as an educational system, since it can be taught more quickly and with better immediate results than the usual notation.

TONK. A native Rajputana State in Central India. Area, 1114 sq. miles. Population, in 1901, 143,330. Capital, Tonk.

TONK. The capital of the native Rajputana State of Tonk, Central India, near the river Banas, 55 miles south of Jaipur (Map: India, C 3). It is defended by a mud fort and a wall. Population, in 1891, 46,069; in 1901, 38,641, the great decrease being largely attributable to the famines of 1896-97 and 1899-1900.

TONKA, tōn'kȧ. The Chinese name of Puket (q.v.).

TONKAWA, tŏng-kä̆'wȧ (from Hueco Indian *tonkaweya*, many staying together). A peculiar tribe, apparently constituting a distinct linguistic stock, originally occupying the country about the Lower Colorado and Guadalupe rivers in southeastern Texas. They call themselves *Titskan-watich*, 'indigenous men.' They were chiefly noted for their cannibalism. They roved from place to place, built circular, thatched houses, lived entirely by hunting and wild fruits, and were at war with almost all their neighbors, by whom they were hated and despised as 'man-eaters.' They appear to have had the clan system and to have paid special reverence to the wolf, whom, it is said, they claimed as their ancestor or teacher. According to their tradition they came from the south, somewhere farther down the coast, having been cut off from the rest of their people by an invasion of the sea. In 1760 some of them were attached to the San Antonio missions. In 1849 they were reported to number 600 or 700, who had been driven to the Upper Brazos on account of their depredations among the American settlements near the coast. In the fall of 1855, with several other small Texas tribes, a part of them, to the number of 170, were gathered upon a reservation on the Brazos, a few miles below Fort Belknap, but they were removed in 1859 to a new reservation on the Washita, near the present Anadarko, Oklahoma. Here they remained until the outbreak of the Civil War, when, on the pretext that they were about to enter the Confederate service through the persuasions of their agent, who held a Confederate commission, the other tribes took the opportunity to wipe out old scores. With guns procured from Fort Gibson a force of about 200 Shawnee, Delaware, Caddo, and other Indians attacked the agency and the neighboring Tonkawa village near Anadarko on the night of October 25, 1862, and killed one or two of the agency employees and 137 out of a total of about 320 Tonkawa men, women, and children. The Tonkawa made a stout resistance and inflicted severe loss upon the enemy. The fugitive survivors were gathered up by the Confederate authorities, and for several years after the war led a vagrant existence in northern Texas, most of the men enlisting as scouts against the Comanche, Kiowa, and other wild tribes, who took every occasion to retaliate, and forced the Tonkawa to keep close to Fort Griffin on the Brazos for protection. In 1875 they were reported to number but 119, in a miserable condition and dependent entirely on the pay of the able-bodied men serving as scouts. In 1882 they were put in charge of a special agent who reported them as numbering then only 98, indolent, poor, honest, and tolerably healthy, living in brush shelters and dependent upon the whites. Two years afterwards they were removed to a reservation in northern Oklahoma. In 1903 they were reduced to about 50, and derived their principal income from the leasing of their surplus lands.

TONKÜNSTLER-SOCIETÄT. One of the oldest musical societies of Vienna. It was founded in 1771 by F. L. Gassmann. Its object is the production of large choral works, particularly oratorios. The original chorus consisted of 400 members, which at times was increased to 700. One concert was given in Lent and another in Advent. The proceeds were devoted to the establishment of a pension fund for old members and widows of members. In 1797 Wranitzky, the friend of Haydn, reorganized the society. Haydn himself became a member and presented to the society the rights of the "Seasons" and "Creation," which generous gift placed the society upon a sound financial basis and was largely responsible for its subsequent prosperity. In 1865 the society was once more reorganized and renamed in honor of its generous patron "Haydn-Societät." Consult Hanslick, *Geschichte des Konzertwesens in Wien* (Vienna, 1869).

TONLE SAP, or Tale Sap. A lake of northwestern Cambodia, connected with the Mekong by an arm of that river known also as Tonle Sap (Map: French Indo-China, E 4). The lake acts as a great reservoir. During the summer monsoon the waters of the Mekong back up through the arm Tonle Sap, bringing the length of the lake to about 120 miles; during the dry season the lake is drained, by the same arm, to about 70 miles in length. During high water navigation is maintained from Saigon to Battambang in Siam. Approaching shores divide the lake into sections, the Caman Dai in the northwest and the Caman Tieu in the southeast.

TONNA, Charlotte Elizabeth (Browne) (1790-1846). An English author born at Norwich. She was twice married, first to a Captain Phelan and after his death to Lewis H. J. Tonna, an English writer. She began her literary career in Ireland, writing under the pseudonym of "Charlotte Elizabeth." Her works were largely of a religious nature and evinced considerable hostility toward the Catholic Church. She was connected with various magazines and wrote numerous religious tracts, novels, poems, and short stories for children. Consult *Works of Charlotte Elizabeth*, with an introduction by H. B. Stowe (7th ed., New York, 1849).

TONNAGE (formerly also *tunnage*, from *tun*, *ton*, from OF. *tonne*, pipe, tun, ML. *tunna*, OHG. *tunna*, Ger. *Tonne*, tun, both the Romance and the Germanic words apparently borrowed from Ir., Gael. *tunna*, tun). The tonnage of a ship is its carrying capacity or weight expressed in tons. There are in ordinary use four ways of expressing it, *gross* tonnage, *net* tonnage, *dead-weight* tonnage (or dead weight carrying capacity), and *displacement* (q.v.) tonnage. The *gross* tonnage of a ship is ascertained by dividing by 100 the whole interior capacity (expressed in cubic feet) of the hull of a ship and her inclosed deckhouses; this method presumes that an average cargo of light-weight freight will require not far from 100 cubic feet for each ton of actual weight. *Net* tonnage is derived from the *gross* tonnage by deducting the capacity of all spaces not used, or capable of being used, for cargo or passengers. The *dead-weight* tonnage is the actual weight of cargo a vessel can carry without immersing her too deeply for safety. *Displacement* tonnage is the weight of ship and cargo or contents when immersed to some fixed depth. In freighting ships 40 cubic feet of merchandise is considered a ton; but if that bulk exceeds 2240 pounds (or, in the United States, frequently 2000 pounds) the charge is made by weight. See articles on DISPLACEMENT; LOAD-LINE MARKS OF VESSELS; MEASUREMENT OF SHIPS; and SHIPBUILDING.

TONNAGE and POUNDAGE. Certain duties on wine and other merchandise, which began to be levied in England in the reign of Edward III. They were at first granted to the Crown by the vote of Parliament for a limited number of years, and renewed on their expiration. Originally fluctuating in amount, tonnage and poundage came to be fixed at 3s. on every tun of wine, and 5 per cent. on all goods imported. In the reign of Henry V. they were first conferred on the King for life; and the same course being followed with his successors, the sovereign began gradually to consider them as his proper right and inheritance, and the vote of Parliament as but a formality expressive of the popular recognition of his prerogative. It was usual to levy these duties during the period intervening between a sovereign's accession and his first Parliament, and this was done by Charles I. as by his predecessors. The Commons, however, in Charles's first Parliament accorded these imposts not for life, but for a year only; and the House of Lords objecting to this departure from previous usages, and rejecting the bill, an attempt was made to levy tonnage and poundage by the royal authority alone, a proceeding which aroused the opposition of the Commons. Charles was, in 1629, induced to pass an act renouncing the power of levying these or any other imposts without Parliamentary sanction. On the restoration, Charles II. obtained a grant of tonnage and poundage for life; but by three several statutes of Anne and George I. these imposts were made perpetual and mortgaged for the public debt. The duties were abolished in 1787.

TONOM'ETER (from Gk. *τόνος*, *tonos*, tone, sound, tension, strength, cord, *μέτρον*, *metron*, measure). An instrument for measuring tension, as of the eyeball or of the blood pressure as transmitted by the ventricles of the heart. Hamer's tonometer consists of a tube of metal, with a peg or small rod projecting and so arranged that a coiled watchspring matches its tension against the tension of the body to which the peg is pressed. Roy's tonometer consists of a tube containing oil in which a cylinder plays, carrying a registering index.

TONQUIN, tŏn-kēn'. A division of French Indo-China. See TONGKING.

TÖNSBERG, tēns'bâr-y'. One of the oldest towns of Norway, in the Amt of Jarlsberg and Laurvik, on a fjord of the same name, 45 miles south of Christiania (Map: Norway, D 7). The seal and whale fisheries employ a large proportion of its male population, with a fleet of some 120 vessels. Population, in 1900, 8620.

TONSIL. One of a pair of small ovoid bodies situated between the pillars of the soft palate, one on each side of the throat, corresponding in position with the angles of the lower jaw. The tonsil has about twelve spaces within its substance from which smaller follicular depressions extend into its structure, and is classed with the ductless glands. It is frequently inflamed after infection by entrance of germs into the crypts and follicles described. Severe suppurative disease about the tonsil causing swelling and displacement of it is termed Quinsy (q.v.). See PALATE.

TONSILLITIS. See PHARYNGITIS; QUINSY.

TON'SON, JACOB (c.1656-1736). A famous London publisher. He opened his shop at the Judge's Head in Chancery Lane, near Fleet Street, in 1678. Toward the close of the century he moved to Gray's Inn Gate, taking into company with him his nephew, Jacob Tonson, and in 1710 to the Shakespeare's Head in the Strand. For Dryden Tonson published several plays, the translation of Vergil (1697), and *The Fables* (1699). He was also helped by Dryden to start the famous *Miscellanies*, of which the first appeared in 1684. With this prestige he became the popular publisher among the next generation of authors. He bought out the rights in Milton's *Paradise Lost*, and from his press issued Rowe's edition of Shakespeare (1709). About 1700 he joined in forming the famous Kit-Cat Club, of which he was made secretary. About 1703 he bought a house at Barn Elms on the Thames, and built a room for the club.

TONSURE (Lat. *tonsura*, a shearing, from *tondere*, to shear, connected with Gk. *τένδειν*, *tendein*, to gnaw, *τέμνειν*, *temnein*, to cut). A religious observance of the Roman Catholic and Oriental churches, which consists in shaving or cutting the hair as a sign of the dedication of the person to the special service of God and commonly to the public ministry of religion. It would appear that the usage first arose in reference to the monastic rather than the clerical life. Paulinus of Nola, in the end of the fourth or beginning of the fifth century, alludes to it as then in use among the Western monks; and it speedily passed from them to the clergy. The form of the tonsure was different in different churches. That of the Roman Church, called 'the tonsure of Peter,' consisted in shaving the crown as well as the back of the head, so that there remained a circular ring or 'crown' of hair. In the 'Scottish (or Irish) tonsure,' the entire front of the head was shaved, leaving the front bare as far back as the line from ear to ear. This tonsure was called 'the tonsure of James,' and sometimes of Simon Magus. The Greeks and other Orientals shaved the entire head. Originally the tonsure was merely the symbol of admission to the clerical state (see CLERK), but about the seventh century it came to be used as a distinct and independent ceremonial.

TONTINE. A tontine exists whenever several persons are united in a group on such terms that on the death of any member of the group certain specified advantages previously enjoyed by him are distributed among the surviving members. The principle has been employed in many kinds of transactions, of which the most important are Government loans and life insurance. The application of the tontine principle to Government loans began in the later Middle Ages. The idea was introduced into France about the middle of the seventeenth century by an Italian named Lorenzo Tonti, but it had already long been known in Italy and Germany. It was one of numerous devices adopted by various States to induce the public to subscribe to Government loans. The first French loan on this principle was made in 1689, and the last one in 1759. Existing tontines were wound up in 1770 and life annuities substituted for their privileges. The English Government made less use of tontines than the French. The earliest one was organized in 1692, and the third and last in 1789. There were a few Irish tontines in the eighteenth century. The idea was unattractive to the English people, and none of the loans was fully subscribed, although offered on very favorable terms.

A subscriber to a tontine loan was the buyer of a life annuity, which increased in amount with the death of any member of the class to which the subscriber belonged. On the death of the last survivor the obligation of the Government terminated. In most cases the subscribers were divided into classes according to age, the right of survivorship prevailing only among the members of the same age class. Sometimes the amount of the annuity at the beginning varied for the different classes. Thus in the first English loan the annuity increased from class to class, being slightly over 4 per cent. for those under twenty years of age, and more than 5½ per cent. for those over sixty. Occasionally there were other limitations. For example, the first English loan, which did not classify subscribers according to age, provided that when the number of survivors was reduced to seven the right of survivorship should cease. On the third loan it was stipulated that no single annuity should exceed £1000. Nearly always the subscriber to a loan had the privilege of naming any other person as the recipient of the life annuity, with the natural result that a large proportion of the annuitants were young. The feature of a tontine loan which was relied on to attract subscribers was the great return secured by those investors who lived longest.

It is obvious that a tontine loan is a very unwise fiscal measure. In the case of ordinary life annuities it is fairly safe for the Government to assume that premature deaths will largely offset exceptionally long lives, but in the case of a tontine there is no such balancing of extra short and extra long lives. It is not the average duration of life of the group which determines the amount of interest which the Government will have to pay, but a much more uncertain thing, the duration of the longest life.

The application of the tontine principle to life insurance has taken two forms. Under the old or full tontine plan, which was in use before the days of surrender values, an insured person who allowed his policy to lapse recovered nothing from the company. The gain which the company had made on his policy was put to the credit of the other insured of the same class. At the end of the tontine period all such profits were distributed among the members of the group whose policies were still in force. After the introduction of surrender values, partly under legal compulsion and partly by the voluntary action of the insurance companies, the so-called semi-tontine plan was adopted. Under this plan there is a similar division of surplus among those members of the group whose policies are in force at the end of the tontine period, but the surplus to be divided is comparatively small. It arises chiefly from two sources, from an expense rate so low that some part of the loading of the premium is saved, and from an interest rate on investments higher than that assumed in calculating reserve values. A person taking out a semi-tontine policy enters into an agreement with the company that the profit thus arising on his policy shall be put into a pool along with the corresponding profit on other policies of the same class, and that at the end of the tontine period, which is usually ten, fifteen, or twenty years, the pool shall be divided among those members of the class whose policies are still in force.

The question of the desirability of applying the tontine principle to life insurance has been the occasion of much discussion. That the full tontine plan was a bad one cannot be questioned, but the evils arose more from the absence of surrender values than from the tontine method of distributing the surplus. For the semi-tontine plan the purely financial argument would seem, on the whole, favorable. In all forms of life insurance the indemnities paid on the policies of those dying early are partly at the expense of those whose policies run a longer time. The distribution of the surplus on the tontine principle is at least a partial reparation. It ought always to be clearly understood, however, that the larger return to those whose policies are kept in force to the end of the tontine period necessarily means a smaller return to those who die or whose policies terminate before that time. The weightiest objection to tontine insurance is a moral one. It is introducing additional uncertainty into the transaction of life insurance, where the speculative element is already large and ought to be kept at a minimum.

Private tontines were by no means uncommon down to the end of the eighteenth century. They were frequently resorted to for the purpose of raising money for purposes requiring large investments of capital. Large buildings in many cities of the United States were erected by means of capital raised in that way. At the present time they are almost unknown, partly because the abundance of capital has made it unnecessary to resort to them, partly because the large element of uncertainty involved in them is inconsistent with the spirit of modern business.

TONTY, or **TONTI**, tôɴ'tē', Henri de (c.1650-c.1704). A companion of La Salle (q.v.) in the exploration of the Mississippi Valley. He was a native of Gaeta, in Italy, and at an early age entered the military service of France. In July, 1678, he went with La Salle to Quebec and with him went to the Niagara River, where a vessel was built under Tonty's direction (January, 1679). In the autumn of the same year Tonty sailed up along the eastern shore of Lake Michigan and met his chief at the Saint Joseph River. In March, 1680, he was left by La Salle in command of Fort Crèvecœur, in the Illinois country. Forced to flee by a mutiny among his soldiers, he made his way to Green Bay, where he passed the winter of 1680-81, and in May met La Salle at Michilimackinac. In 1682 he was with La Salle in the memorable voyage down the Mississippi and in May of that year he was dispatched to Mackinac for supplies. In December Fort Saint Louis was erected at Starved Rock, on the Illinois, and Tonty was left in charge. In 1685 he took part in an expedition of the Illinois Indians against the Senecas and in 1687 he was with Denonville in the expedition against the English colonies. In February of the preceding year he had descended the Mississippi in search of La Salle. He continued to live among the Illinois Indians till 1702, when he joined Iberville in Louisiana. Spurious memoirs were published under his name at Paris in 1697 under the title, *Dernière découverte de la Salle dans l'Amérique septentrionale*. His real memoirs were published by Margry in *Origines françaises des pays d'outremer* (Paris, 1877-79).

TOOKE, John Horne (1736-1812). An English etymologist and political adventurer. He was born in London, and was the son of John Horne, a poulterer. He was educated at Westminster and Eton, and at Saint John's College, Cambridge. He entered the Church strongly against his own wish, and in 1760 became curate at New Brentford. In 1763 he traveled in France for a year as the tutor of the son of John Elwes, and two years later, while acting as the tutor of another boy, he met John Wilkes (q.v.). When Wilkes stood as a candidate for the County of Middlesex, Tooke zealously aided him, but the pair afterwards quarreled. Tooke still, however, continued to meddle in political affairs, and ventured to encounter Junius, with whom some have even sought to identify him. In 1773 he resigned his living at New Brentford, and commenced the study of law. About this time he rendered some important private service to Tooke of Purley in Surrey, who intended to make him his heir. In consequence he adopted the surname of Tooke, by which he is now known. In 1775 he was fined and imprisoned in the King's Bench for publishing an advertisement in which he accused the King's troops of barbarously murdering the Americans at Lexington. While in prison he penned his celebrated *Letter to Mr. Dunning* (dated April 21, 1778), in which are to be found the germs of his *Diversions of Purley*. On his release Tooke made an attempt to gain admission to the bar, but was refused on the ground of his clerical orders. Soon afterwards he returned to political writing, and in a *Letter on Parliamentary Reform* advocated universal suffrage. In the struggle between Pitt and Fox he wrote pamphlets on the side of the former, but soon got to hate Pitt, as he had learned to hate most other public men. In 1786 appeared the first volume of his famous *Epea Pteroenta, or the Diversions of Purley* (vol. ii., 1805), a work on the analysis and etymology of English words. Tooke's passion for politics soon drew him from literature into public life, and in 1801 he, the great enemy of rotten boroughs, entered Parliament for the most notorious rotten borough in England—Old Sarum; but he made no figure there. The best edition of the *Diversions of Purley* is that of Taylor (London, 1840). Consult Stephens, *Memoirs of John Horne Tooke* (London, 1813).

TOOKE, Thomas (1774-1858). A British economist. He was born in Saint Petersburg. In 1804 he became partner in a prominent Russian house in London; later he became director of the Royal Exchange Assurance Corporation; president of the Calhamie Dock Company; member of the managing board of the London and Birmingham Railway. He was a member of the first great Factory Commission, and president of the commission appointed to inquire into the evils of child labor in factories. From his practical experience in the Russian trade Tooke developed a strong antipathy to governmental interference in foreign commerce. He was author of the *Merchants' Petition in favour of Free Trade*, presented to Parliament in 1820. He was chiefly interested, however, in questions relating to money and banking. In these subjects he is regarded as one of the best authorities of the times. He was the leading opponent of the 'quantity theory' of money, and was a harsh critic of Paul's Banking Act of 1844. He was author of several works on currency problems, of which the most important are his *On the Currency in connection with the Corn Trade, and on the Corn Laws* (1820); *Considerations on the State of the Currency* (1826); *An Inquiry into the Currency Principles and the Connection of the Currency with Price* (1844); *A History of Prices—1793-1856* (1838-1857), six vols., the last two written in collaboration with W. Newmarch.

TOOKE, William (1744-1820). An English historian, born at Islington, London, and educated there at an academy. Taking holy orders in 1771, he became chaplain to the English church at Kronstadt, in Russia, and three years later chaplain to the English merchants at Saint Petersburg. Coming into possession of a fortune, he resigned in 1792, and returned to London, where he devoted the rest of his life to literature. His most valuable work was in Russian history, based upon research in the Imperial Library at Saint Petersburg. It embraces mainly *The Life of Catharine II.*, partly a translation from the French (1798); *A View of the Russian Empire During the Reign of Catharine II., and to the Close of the Present Century* (1799); and *A History of Russia from the Foundation of the Monarchy by Rurik to the Acces-*

sion of Catharine II. (1800). He published numerous miscellaneous books, as *The Loves of Othniel and Achsah,* a Chaldee romance (1769); *Varieties of Literature* (1795); and *Lucian of Samosata,* from the Greek, with the comments of Wieland and others (1820). His son, WILLIAM TOOKE (1777-1863), took a prominent part in founding University College, London, and also the Society for the Diffusion of Useful Knowledge. He was also a member of the Royal Society and president of the Society of Arts. He edited the poems of Churchill, compiled *The Monarchy of France* (1855), and published a volume of verse.

TOOLE, JOHN LAWRENCE (1832—). An English comedian, born in London. He made his début in London at the Haymarket Theatre in 1852. Upon the opening of the new Adelphi Theatre by Benjamin Webster in 1859, Toole became the leading comedian, and there, in 1862, he appeared in his great part of Caleb Plummer, in Boucicault's dramatization of *The Cricket on the Hearth.* In 1868 he played the Artful Dodger at the Queen's Theatre, with Henry Irving as Bill Sykes. He visited America in 1875, and in 1890 made a successful trip to Australia. He opened Toole's Theatre (the Folly Theatre reconstructed) in November, 1880, and managed it as a home of comedy for a number of years. Consult: Toole's *Reminiscences,* chronicled by Joseph Hatton (London, 1888); Matthews and Hutton, *Actors and Actresses of Great Britain and the United States* (New York, 1886); Scott, *The Drama of Yesterday and To-day* (London, 1899).

TOOMBS, ROBERT (1810-85). An American statesman, born at Washington, Ga. He studied at the State University at Athens and graduated (1828) at Union College, Schenectady, N. Y. He studied law at the University of Virginia, and began practice in Wilkes County, Ga. After service against the Creeks in 1836 and several years in the Georgia Legislature as a States' Rights Whig, he was elected to Congress in 1844 and held his seat for four terms, until 1853, when he was elected to the United States Senate, and in 1859 reëlected. He opposed the Mexican war and the annexation of territory by force, aided in the adoption of the Compromise of 1850, opposed the Nashville Convention, and helped secure the famous 'Georgia Platform.' As an impassioned political speaker he had few equals. The movement of secession had his full approval; and it was chiefly his influence, in opposition to the more conservative views of his life-long friend, Alexander H. Stephens, that led his State to pass its ordinance of secession, to which there was a strong opposition, especially among the 'old line Whigs.' On the election of Davis, Toombs was offered the office of Secretary of State, and with reluctance accepted it for a short time, on his resignation receiving a commission as brigadier-general. He served in the second battle of Bull Run and at Antietam, and later was made brigadier-general of the Georgia militia. After the war he lived for some time abroad; then from 1867 he carried on a successful law practice at his old home, being especially serviceable to Georgia by winning his contention that railroads should pay taxes like other property. He was noted for his brilliant wit, his legal sagacity, and his benevolence. He was a bitter opponent of the 'Reconstruction' measures, and never took the oath of allegiance. He is mainly remembered as one of the most typical and vigorous of the so-called Southern 'fire-eaters.' Consult Trent, *Southern Statesmen of the Old Régime* (New York, 1897).

TOON (Hind. *tūn, tun,* from Skt. *tunna,* toon); or TOONA (*Cedrela Toona*). A tree of the natural order Cedrelaceæ, one of the largest timber trees of India, occurring also in Australia, where it attains a height of 150 to 180 feet and a diameter of 5 to 7 feet. Hooker mentions one which he measured in India which was 30 feet in girth at 5 feet above the ground. The flowers are used in India for dyeing. The tree, sometimes called bastard cedar, occurs at 4000 feet on the Himalaya Mountains, and is found in the farthest south of the East Indies. The bark contains considerable tannin and is used to produce a kind of purplish leather. The wood is soft, durable, easily worked, and extensively used in house-building and for furniture. Veneers cut from the roots or from the trunks where large branches occur are said to be very beautiful. The timber is exported from India in considerable quantities, being known in the English market as Maulmain cedar.

TOOTHACHE TREE. See ARALIA; ZANTHOXYLUM.

TOOTH-BILLED PIGEON. An extraordinary member of the pigeon tribe (*Didunculus strigirostris*) native to Samoa, and alone representing a separate family (Didunculidæ). This species, known to the Samoans as *manu-mea,* or 'redbird,' is about one foot long, and glossy greenish black, with a chestnut tinge on the upper parts and brown on the wing-quills and abdomen. Its most striking characteristic is a great orange-colored, hawk-like, toothed bill, suitable for gathering the bananas and other large fruits upon which it lives. It was originally wholly terrestrial in its habits, spending its time on the wooded mountain sides, where it roosted on rocks and stumps and nested on the ground, rarely gathering into parties. It was hunted for food. This circumstance, the fact that it laid but a single egg, and the introduction by white settlers of cats, rats, and guns, led not only to its speedier destruction, but to an interesting change in habits, since it soon resorted much more to tall trees than previously and placed its nest on high branches. See Plate of PIGEONS.

TOPAZ (Lat. *topazion, topazus,* from Gk. *τοπάζιον, τόπαζος,* topaz; possibly connected with Skt. *tapas,* heat, but, according to Pliny, derived from the name of an island *Topazus,* conjectured to be in the Red or in the Arabian Sea, from Gk. *τοπάζειν, topazein,* to conjecture). A mineral aluminum fluosilicate, crystallized in the orthorhombic system. It has a vitreous lustre, and may be colorless, yellow, green, blue, or red. Topaz occurs in gneiss or granite associated with beryl, mica, tourmaline, etc., and occasionally with apatite, cassiterite, and fluorite, and also in certain talcose rocks, in mica slate, in rhyolite, and in alluvial deposits and drift. The crystallized varieties, owing to their hardness, are valued as gem-stones, and the best varieties come from Ceylon and other parts of India, the Urals, Minas Geraes, Brazil, and in the

United States from various localities in Maine, Colorado, and Utah. The name *topaz* was applied by Pliny and others to yellow crystals, probably chrysolite. Among the ancients it was regarded as symbolical of friendship; when worn as an amulet it was said to drive away sadness and nightmares, strengthening the intellect and bestowing courage; mounted in gold and hung around the neck, it dispelled enchantment; and when worn on the left hand it preserved its wearer from sensuality. It was considered favorable for hemorrhages, also imparting strength and good digestion. When powdered and taken in wine it was believed capable of curing asthma and insomnia. The true Oriental topaz is the yellow sapphire, and the Saxon, Scotch, Spanish, smoky, and false topaz are yellow varieties of quartz.

TOPE (Hind. *tōp*, from Pali, Prak. *thūpa*, from Skt. *stūpa*, mound, accumulation). The vernacular name of Buddhistic monuments intended for the preservation of relics. In Ceylon and elsewhere they are also called *dagops;* and another of their designations is *chaitya. Tope* is the name of those monuments in regard to their shape; *dagop*, in regard to their purpose; and *chaitya* the general term. Technically, the *stupa* is a form of tope which does not contain a relic, but is merely a memorial. The oldest topes are in the shape of cupolas, generally spherical, but sometimes elliptical, resting on a cylindrical or quadrangular or polygonal base, which rises either in a straight or inclined line, or in terraces. The top of the cupola, surrounded by a balcony of pillars of a peculiar kind, is crowned by a structure generally quadrangular, but sometimes in the shape of a reversed pyramid of a few steps; and over this structure is a roof in the shape of an extended parasol. The cupola was sometimes ornamented with more than one parasol; in some of the topes of Sanchi there are three, and even five parasols side by side, the middle one exceeding the others in height. The different arrangement of these parasols, especially when their number increased, led to a different shape of the topes, such as occurs, for instance, in China and Tibet. This arrangement consists in placing them one over the other; and not only three or five, but even seven, nine, or more are so placed, and the topes, instead of having the character of cupolas, now assumed that of pyramids resting on a cupola base, the parasols gradually giving way to a real pyramidal form. In some monuments of this class, however, the cupola was placed above, when the base consists of round or quadrangular towers rising in a spiral form, or in several stories. The Chinese, on the contrary, rejected the cupola altogether, and merely retained the succession of parasols extended one over the other, converting them into a many-storied tower; and the same is the case with the topes of the Mongols, the *ssuvurghans*, which are pyramids erected on a low quadrangular base. The top of the pyramidal topes always carries some metal ornament, frequently gilt, resembling a parasol, or a needle, or a trident, or a rising flame. The height of these buildings varies from a few feet to 300 and even more. If erected in cave-temples the tope generally stands at the end of a long hall especially cut out for it, but sometimes also in the sanctuary of the cave-temple itself; if erected overground it stands always in the vicinity of a temple or convent.

In the interior of the tope is the cell or chamber (*dhâtugarbha*) where the box containing the relics and the 'seven precious things' was placed. These seven precious things are differently enumerated; according to one account they are gold, silver, lapis lazuli, crystal, red pearl, diamond, and coral; others mention ruby and emerald; and others again omit gold and silver. In several cells which have been opened the box contained, besides the relics, precious stones of various kinds, golden ornaments, and coins; and the box itself generally consisted of an outer casement of stone, clay, or bronze, which inclosed a silver cylinder, and within this a golden cylinder, which was the real receptacle of the relics. Both cylinders had generally a convex lid, representing the shape of the cupola, and the box exhibited inscriptions commemorating the name of the saint to whom the ashes or other relics contained in it had belonged. It seems that there are also topes which had the relics placed, not within, but under them. The cupola of the topes was intended to represent the water-bubble, the Buddhistic symbol of the hollowness and perishability of the world, while the parasol of the topes was intended to imply the royal dignity possessed by a Buddhistic saint. When the topes became pyramids or towers consisting of terraces and stories, the number of the latter had likewise a symbolical import. Thus, only the topes of the most accomplished Buddhas had thirteen terraces, to show that these Buddhas had passed beyond the twelve causes of existence; three terraces imply the three worlds —the world of desire, that of form, and that of absence of form; five, the five steps of Mount Meru; and so on.

The most important is the Bhilsa group in Central India, of which the most famous is the Sanchi Stupa, and near it are two minor groups, at Sonari and Satdhara. In Bengal is that of Sarnath, one hundred and twenty-eight feet high. The great tope at Amravati is the most interesting for the wealth and beauty of its sculptures. Others are at Gandhara, Telelabad, and Menikalya. The sculptured rails are described under INDIAN ART. See Koeppen, *Die Religion des Buddha* (Berlin, 1857); Fergusson, *History of Indian and Eastern Architecture* (London, 1876).

TOPE. A small European shark (*Galeorhinus galeus*). It is represented on the Western American coast by the so-called 'oil' or 'soup-fin' shark (*Galeorhinus zyopterus*), about six feet long and gray with black-edged dorsals. The name is also given to the related small dog-shark (*Mustelus canis*) of the North Atlantic. See Plate of LAMPREYS AND DOGFISH.

TOPE'KA. The capital of Kansas, and the county seat of Shawnee County, 66 miles west of Kansas City; on the Kansas River, and on the Missouri Pacific, the Union Pacific, the Atchison, Topeka and Santa Fe, and the Chicago, Rock Island and Pacific railroads (Map: Kansas, G 2). It is situated on rolling prairie land, at an elevation of over 800 feet, and covers an area of about 7 square miles. Beautiful shade trees and handsome residences add to the city's attractiveness. The most notable structure is the State Capitol, in the heart of the city.

Other noteworthy edifices are the Public Library (containing 24,000 volumes), the United States Government Building, the county court-house, and the city hall and auditorium. The Melan Arch Bridge, which cost $150,000, possesses considerable architectural merit. Topeka is the seat of Washburn College (Congregational), opened in 1865; of the College of the Sisters of Bethany (Protestant Episcopal), opened in 1861; and of the Kansas Medical College. The State Insane Asylum and the State Reform School are also here. The prominent local charitable institutions include the Santa Fe Railway Hospital, the Jane C. Stormont Hospital and Training School for Nurses, Christ Hospital, Bedwell's Private Insane Asylum, Detention Hospital, and Ingleside, a home for aged women.

The industrial interests are centred chiefly in the extensive shops of the Santa Fe Railroad, and in the manufacture of flour. Of the smaller establishments, the most important are foundries and machine shops, lumber mills, and manufactories of boilers, trusses, woolen goods, etc. In the census year 1900 the total capital invested in all industries was $3,891,530; the value of their output amounted to $9,977,605. Considerable wholesale and jobbing business is carried on in Topeka. The government is vested in a mayor, chosen biennially, and a unicameral council. Subordinate officials, with the exception of the board of education, which is elected by popular vote, are appointed by the mayor, subject to confirmation of the council. The electric light plant and the water-works are owned by the municipality. The city spends annually for maintenance and operation about $323,000, the chief items being: schools, $102,000; interest on debt, $52,000; streets, $33,000; fire department, $28,000; and police department, $25,000. Population, in 1890, 31,007; in 1900, 33,608.

Topeka, laid out in 1854, was one of the 'Free State' towns founded by Eastern anti-slavery men immediately after the passage of the 'Kansas-Nebraska Bill.' In 1856 an anti-slavery convention adopted here the 'Topeka Constitution,' in pursuance of which the 'Topeka Government' was established, to be soon broken up by the United States troops. During this year Topeka became notorious for the raids made by its citizens on pro-slavery settlements. In 1857 Topeka was chartered as a city, becoming a city of the first class in 1881. It was made the capital of the State in 1861. Consult Giles, *Thirty Years in Topeka, a Historical Sketch* (Topeka, 1886).

TOPELIUS, tô-pā′lê-ụs, ZACHRIS (1818-98). A Swedish-Finnish poet and novelist, born at Kuddnäs, near Ny Karleby, and educated at the University of Helsingfors. In 1863 he became professor of the history of Finland and the North at the university. He resigned his professorship in 1878. As a lyric poet he was second only to Runeberg, and his children's stories have been translated into many languages. His publications include: *Ljungblommor* ("Flowers of the Heath," 3 parts, 1845-50); *Efter femtio ar* (play: "After Fifty Years," 1851); *Fältskärns Berättelser* ("Tales of an Army Surgeon," 1853-67); *Läsning för Burn* ("Children's Stories," 7 parts, 1865-91); and *En resa i Finland* ("A Journey in Finland," 2d ed. 1885).

TOPETE Y CARBALLO, tō̇-pā′tȧ ē kär-bä′lyō̇, JUAN BAUTISTA (1821-85). A Spanish admiral and politician, born at San Andrés de Tuztla, Mexico. He entered the navy at the age of seventeen and became midshipman in 1843 and lieutenant two years later. From 1846 to 1849 he served in Cuban waters and subsequently was on duty in the Mediterranean. He was promoted to the captaincy of a frigate in 1857 and during the war with Morocco in 1859 was chief of staff to the fleet. About this time he formed political affiliations with the Union Liberal Party under O'Donnell and in 1862 was elected to the Cortes from Cadiz. He was on the Pacific station during the conflict with Peru and Chile in 1865-66 and was severely wounded in the bombardment of Callao in May of the latter year. Made brigadier on his return and placed in command of the port of Cadiz he took an active part in the political conspiracies of the times and by his *pronunciamiento* of September 17, 1868, gave the signal for the outbreak of the Revolution which drove Isabella II. from the throne. He sent a ship to bring back the generals who had been deported to the Canaries (see SPAIN) and after he had been joined by Prim and Sagasta won over the city of Cadiz to the Revolution. In the provisional government Topete assumed the portfolio of Marine. He favored the election of the Duke of Montpensier to the throne and laid down his post when the choice fell upon Amadeus of Savoy. In 1872, however, he resumed office under Serrano and during the latter's absence from the capital presided over the Ministerial Council. In the Revolution of 1873 he was imprisoned for a short time but regained influence under the presidency of Serrano who placed him once more at the head of the navy. With Serrano he fought against the Carlists in the north. On the accession of Alfonso XII. Topete retired from active participation in politics. In 1879 he was made a life Senator and in 1881 became vice-admiral. He died at Madrid, October 29, 1885.

TÖPFFER, tẽpf′ẽr, RODOLPHE (1799-1846). A Swiss novelist and draughtsman, born in Geneva, son of the landscape and genre painter Adam Töpffer (1766-1847), under whose instruction he devoted himself to art. His eyesight failing, he took up teaching, in 1825, established a boarding school, and in 1832 became professor of æsthetics at the Academy of Geneva. His novel *Le presbytère* (1839) attracted universal attention. The *Nouvelles genevoises* (1838), *Nouvelles et mélanges* (1840), *La bibliothèque de mon oncle* (1843), and *Rose et Gertrude* (1845) are hardly less delightful than the humorous sketches of travel *Voyages en zigzag* (1848) and *Nouveaux voyages en zigzag* (1853), illustrated by himself. A little archaic in style, his work is simple, artistic, sound, and witty, with a childlike fancy and sentiment. Among his best productions are the seven little novels in pictures: *Mr. Jabot, Mr. Crepin, Mr. Pencil, Le docteur Festus, Histoire d'Albert, Les amours de Mr. Vieux Bois,* and *Mr. Cryptogame,* published together in *Collection des histoires en estampes* (Geneva, 1846-47). For his biography consult Relave (Paris, 1886); Blondel and Mirabaud (ib., 1887); and Glöckner (Zerbst, 1891).

TOPHET, tō′fĕt (Heb. *tōpheth*). A place in the Valley of Hinnom, south of Jerusalem, associated with the worship of Molech (II. Kings xxiii. 10; Is. xxx. 33; Jer. vii. 31-32; xix. 6, 12-14). The origin and meaning of the name are uncertain. See Hinnom, Valley of; Molech.

TOPINARD, tô'pē'när', Paul (1830—). A French anthropologist, born at Isle-Adam (Seine-et-Oise). He spent ten years in the United States, returned to study medicine in Paris, and established himself there in 1869, but after 1871 gave up his practice in order to study anthropology under Broca. He became curator for the Société d'Anthropologie in 1872, assistant director of the anthropological laboratory in the Ecole des Hautes Etudes, professor in the school of anthropology (1876), and secretary-general of the Société d'Anthropologie after Broca's death in 1880. He also succeeded Broca as editor of the *Revue anthropologique*, was commissioner for the section of anthropology at the exhibition of 1889, and in that year was admitted to the Legion of Honor. His publications include *Etude sur la taille considérée suivant l'âge, le sexe, l'individu, les milieux et les races* (1865); *Etude sur les races indigènes d'Australie* (1872); *L'Anthropologie* (1876); *Des anomalies de nombre de la colonne vertébrale chez l'homme* (1877); and *Eléments d'anthropologie générale* (1885).

TOP'LADY, Augustus Montague (1740-78). A clergyman of the Church of England. He was born at Farnham, Surrey, and was educated at Westminster School and Trinity College, Dublin (B.A. 1760). He was ordained priest in 1764 and became rector of Broad Hembury in 1768. In 1775 failing health necessitated his removal to London, where he died of consumption, August 14, 1778. He was the great champion of Calvinism in the Church of England, and wrote much against the Methodists, with vigor of language and argument, but often with undue asperity of style. He is best known as the author of the popular hymn "Rock of Ages, Cleft for Me" (1775). He edited for several years the *Gospel Magazine*. His controversial works, mostly in reply to Wesley, are numerous. The best was *The Historic Proof of the Doctrinal Calvinism of the Church of England* (1774). His works were published with memoir (6 vols., 1794; 2d ed., 1825); there is another memoir by W. Winters (London, 1872). Of his poetry the best edition is by D. Sedgwick (London, 1860).

TÖPLER, tẽp'lẽr, August (1836—). A German physicist. He was born in Brühl, on the Rhine, and was educated in Berlin, and after various minor appointments became professor at the Polytechnic School in Riga in 1864, and in 1868 professor of physics in Gratz, where he built the Physical Institute. In 1876 he was called to the professorship of physics in the Polytechnic Institute in Dresden. He devised numerous forms of apparatus, especially in connection with optical and electrical phenomena. The electrical machine that bears his name is perhaps the best known of his inventions. Besides numerous papers he wrote *Optische Studien nach der Methode der Schlierenbeobachtung* (1865).

TÖPLITZ, tẽp'lĭts. A town of Austria. See Teplitz.

TOP-MINNOW. One of the minnows of the extensive genus Gambusia. They are small viviparous fishes inhabiting still waters in the Southern States, Mexico, and Cuba, and keeping near the surface of the water. See Minnow; and Plate of Killifishes and Top-Minnows.

TOP-SHELL. A mollusk of the scutibranchiate family Trochidæ, so called because the shell, when reversed, often presents a striking similarity in shape to a boy's top. When ground and polished they are extremely beautiful, and are largely used as ornaments. The operculum is horny, circular, multispiral, and has a central nucleus; and these operculæ were formerly highly valued in the East to serve the purpose of an artificial eye. These mollusks dwell in great numbers and variety along all weedy coasts, and feed upon marine herbage.

TOP-SHELL (*Trochus Niloticus*).

TOPSY. A typical young slave in *Uncle Tom's Cabin*. She is ignorant and morally undeveloped, but shrewd and cunning.

TORAH, or **THORAH**, tō'rȧ (Heb. *hattōrāh*, law, direction, Babylon. *tertu*, oracle, divine revelation). The Hebrew term technically applied to the Pentateuch. Besides the term Torah, there is also used *Tōrath Mōshe*, i.e. Law of Moses, on the basis of the tradition which ascribes the whole Pentateuch (the historical as well as the legal portions) to Moses. Traces of the original sense of Torah as 'oracle' are to be found in various passages of the Old Testament. Consult Haupt, "Babylonian Influence in the Levitic Ritual," in the *Journal of Biblical Literature*, vol. xix. (1900); Zimmern, *Beiträge zur Kenntnis der babylonischen Religion* (Leipzig, 1896-1900).

TORBANEHILL MINERAL. See Torbanite.

TORBANITE, Torbanehill Mineral, or Boghead Coal. A dark brown variety of cannel coal found at Torbanehill, near Bathgate, Scotland. It contains over 60 per cent. of volatile matter and is extensively used for the extraction of burning and lubricating oils, paraffin, and illuminating gas.

TOR'BERT, Alfred Thomas Archimedes (1833-80). An American soldier, born at Georgetown, Del. He graduated at West Point in 1855. He took part in the Peninsular campaign, and in August, 1862, became commander of a brigade of the Sixth Corps, which he led during the campaigns of Northern Virginia and Maryland, participating in the second battle of Bull Run and in the battles of South Mountain and Antietam. He was commissioned brigadier-general of volunteers in 1862, and by his gallantry at Gettysburg earned the brevet of major in the Regular Army. In April, 1864, he was transferred to the cavalry, and was placed in command of the First Division of the Army of the Potomac. He commanded at the actions of Hanovertown, Matadequin Creek, Winchester, Kearnysville, Milford, Luray, Waynesborough, Mount Crawford, Ponis Run, Liberty Mills, and Gordonsville. He was brevetted major-general of volunteers in 1864, and in the Regular Army in 1865. He was mustered out of the volunteer service in 1866, and resigned his commission in the Regular Army. In 1869 he was appointed United States Minister to the Central American States; in 1871 was transferred as consul-general to Havana, Cuba; and in 1873 was transferred as consul-general to Paris, France. This last office he held until 1878. He was drowned in a wreck off Cape Canaveral, Fla.

TORCELLO, tôr-chĕl′lō. A small town and island in the lagoon of Venice, Italy, six miles northeast of Venice. The seventh-century Byzantine cathedral, Santa Maria, has a gorgeous twelfth-century mosaic representing biblical scenes. The Santa Fosca Church is also architecturally interesting. There are two small museums of antiquities. The population of the island is about 130.

TORCH DANCE. Specifically, a ceremony held at certain European courts, especially that of Prussia, upon the marriage of any member of the ruling house. It is participated in by Ministers of State and Privy Councilors, as well as by the members of the royal family. Its most striking feature is a march or procession about a hall of the palace by the bride and bridegroom accompanied by their relatives and led by the Ministers and Councilors, in pairs, all of whom carry lighted wax candles. The torch dance is probably a survival from early fire-worship ceremonials, which under various forms appeared sporadically in Europe during the Middle Ages.

TOR′DA. A town of Hungary. See THORENBURG.

TORDESILLAS, tôr′dā-sēl′yās, CONVENTION OF. See DEMARCATION, LINE OF.

TO′RELL, OTTO MARTIN (1828-1900). A Swedish naturalist, born at Warberg. He studied medicine and the natural sciences at Lund and then traveled through Scandinavia, Switzerland, and Iceland engaged in scientific investigation. In 1858 he accompanied Nordenskjöld to Spitzbergen, thence making his way to Greenland, and in 1861 he went again with Nordenskjöld to Spitzbergen. Five years afterwards he was appointed professor of zoölogy and geology at Lund. In 1871 he was called to Stockholm as chief of the Geological Survey. His map of Sweden ranks with the best that have been made. Besides many papers on the Ice Age and upon animal life in the North, he wrote an account of the Swedish expeditions to Spitzbergen of 1861, 1864, and 1868.

TORELLI, tō-rĕl′lē, ACHILLE (1844—). An Italian dramatist, born at Naples. He wrote his first comedy, *Dopo morte*, at the age of sixteen—a piece still played under the title *Chi muore, giace*. In 1867 his *I mariti* scored a tremendous triumph, which, however, was not repeated. In 1878 he was made director of the San Carlo Theatre at Naples. His other plays include: *Prima di nascere* (1862); *Il precettore del rè* (1863); *Il colore del tempo* (1875); and *Scrollina* (1880).

TORELLI, GIUSEPPE (c.1660-1708). An Italian violinist and composer, born in Verona, originator of the *Concerto grosso*. This form of music remained in favor until the time of Handel and prepared the way for the modern symphony. With Corelli, Torelli was the principal musician of his time. He became connected with the Church of San Petronio at Bologna (1685), joined the Accademia Filarmonica of that city, and in 1703 was made concert master to the Margrave of Brandenburg.

TORELLI-TORRIANI, tôr′rē-ä′nē, MARIA. An Italian novelist, born at Novara, better known under her pseudonym Marchesa Colombi. She prepared for a pedagogical career, but, failing to secure a position, resorted to her pen, and after marrying, in 1869, Eugenio Torelli-Viollier, editor of the *Corriere della Sera* in Milan, produced a series of tales which made her widely popular. Her first book, *La gente per bene* (1877), created a sensation, and was followed by the novel *Tempesta e bonaccia* (1878), which, however, did not attain to the merit of the tale *In Risaia* (1877), a touching description of peasant misery. Her other publications include: *Piccole cause* (1879); *Senz' amore* (1883); *Il tramonto d'un ideale* (1883); *Giornate piovose* (1884); *Prima morire* (1887); *Troppo tardi* (1890); *Cara speranza* (1895); *Le gioie degli altri* (1900); and the collection of poems *Lungo la vita* (1891).

TORFÆUS, tôr-fē′ŭs, THORMODUS, or THORMODR TORFASON (1636-1719). An Icelandic antiquary. He was born at Engö, Iceland; was educated at the University of Copenhagen; and in 1662 returned to Iceland by command of Frederick III. to collect saga manuscripts. In 1667 he was appointed royal antiquary, and in 1682 royal historiographer for Norway. He translated several Icelandic works into the Danish language, and was the author of *Historia Vinlandiæ Antiquæ* (1705); *Grœnlandia Antiqua* (1706); and *Historia Rerum Norvegicarum* (4 vols., 1711).

TORGAU, tôr′gou. A fortified town of the Province of Saxony, Prussia, on the left bank of the Elbe, 31 miles east-northeast of Leipzig (Map: Prussia, E 3). The Castle of Hartenfels (1481-1544), one of the largest Renaissance edifices in Germany, was once the residence of the electors of Saxony. It is now used as barracks. There is a museum of Saxon antiquities. Gloves, glass, druggists' sundries, cigars, and biscuits are manufactured. Frederick the Great here defeated the Austrians in 1760. Population, in 1900, 11,807.

TORII, tō′rē′ (Jap., bird-rest, or, less probably, gateway). An archway formed by two upright posts and one horizontal beam, placed before the Shinto shrines in Japan. It is supposed that the Torii was originally a perch for sacred fowl who were to herald the approach of day.

TORLO′NIA. A princely Roman family. Its founder, GIOVANNI TORLONIA (1754-1829), was a poor *cicerone* of Rome, who grew enormously rich in manipulating *assignats* during the French Revolution, and as banker for many kings and princes. He was made a grandee of Spain, and Duke of Bracciano by the Pope. His three sons married into the highest families, the eldest succeeding to the dukedom, the youngest, ALESSANDRO, becoming Prince of Civitella-Cesi and Duke of Ceri, and acquiring immense wealth, of which he made charitable use. He acquired fame by successfully draining Lake Celano (Fucino) at an expenditure of over $800,000, thereby restoring to cultivation 36,000 acres of land.

TORMENTIL (Fr. *tormentille*, from ML. *tormentilla*, *tormentella*, tormentil, from Lat. *tormentum*, torment, from *torquere*, to rack, twist, torment; so called because the plant was supposed to be a remedy for toothache). A popular name for *Potentilla tormentilla*, formerly called *Tormentilla officinalis*, common on European moors and heaths. Its large woody roots have been used as an astringent and for staining leather. It also supplies material for a red dye sometimes used in Lapland. The leaves are ternate, the leaflets lanceolate and inciso-serrate, the stems ascending and forking, the flower-stalks axillary and terminal, and the flowers yellow.

TORNADO. See WIND.

TORNEÅ, tôr′nĕ-ô. A town in the Government of Uleåborg, Finland, Russia, situated on the Torneå, near the northern end of the Gulf of Bothnia (Map: Russia, B 1). Population, in 1897, 1400. About 33 miles north is the Mountain of Avasakra (1573 feet), which is visited by many tourists at the summer solstice, when the sun remains above the horizon for almost two days.

TORNEÅ. A river, forming the boundary between Russia and Sweden. It rises in the Tornea Lake near the Norwegian boundary, and flows southeast through Sweden, then south on the Russian boundary, entering the Gulf of Bothnia at its northern extremity, after a course of 250 miles (Map: Sweden, K 3). Near its mouth is the town of Torneå (q.v.). Its chief tributary, the Muonio, forms the northern part of the boundary.

TORO, tō′rô. An ancient town of Spain, in the modern Province of Zamora, in Leon, on the right bank of the Duero, 38 miles southwest of Valladolid, on the Medina del Campo-Zamora Railroad (Map: Spain, C 2). It contains numerous religious houses and palaces, most of which have been allowed to fall into a state of decay, and the Cathedral Church of Santa Maria la Mayor, dating from the reign of Alfonso VII. There are brandy distilleries, vineyards, tanneries, and woolen manufactories. Population, in 1900, 8187. Toro has been of little importance in Spanish history since its resistance to Charles V., when it took a leading position in the rebellion of the *comunidades*.

TÖRÖK-SZENT-MIKLÓS, tẽ′rĕk sĕnt mē′klōsh. A commune of the County of Jász-Nagy-Kun-Szolnok, Hungary, 66 miles southeast of Budapest (Map: Hungary, G 3). The extensive plain in which it is situated is noted for its production of cereals and live stock, and in the commune itself there is some manufacture of brick and of agricultural implements. Population, in 1900, 21,881.

TORON′TO. The capital of the Province of Ontario, Canada, on the north shore of Lake Ontario, 333 miles southwest of Montreal (Map: Ontario, D 4). It is situated on the north side of a spacious inlet called the Bay of Toronto, has a water frontage of about eight miles from east to west, and extends inland from south to north about three miles. The harbor or bay, about five miles long and one mile in width, is protected by a sandy islet, which extends into the lake in a south and west direction to a distance of five miles. The port accommodates the largest vessels that navigate the lakes, has a dry dock 198 feet long, and is defended at the entrance by a fort. The Grand Trunk and the Canadian Pacific railroads pass through the city, and connect with all parts of Canada and of the United States.

The scenery of the vicinity is somewhat tame, and the situation of the town is low and flat. The most elevated quarter—the Queen's or University Park in the west—lies from 100 feet to 200 feet above the level of the lake. There are many handsome official buildings, including the new city hall and court house, the supreme courts of the province, the legislative buildings, the Government House, the custom-house, the post-office, the horticultural gardens, and benevolent institutions. There are several parks, including Riverdale; the Queen's Park, already referred to with its beautiful monument to the volunteers who fell at Ridgeway in 1866; and the exhibition grounds where the important annual fair of the Industrial Association is held each September. Toronto is distinguished for its churches. The principal are Saint James's Cathedral (Anglican), a noble edifice in early English, erected in 1852; Saint Michael's Cathedral (Roman Catholic); Saint James's and Saint Andrew's (Presbyterian); the Metropolitan Methodist Church, noted for its huge organ; Jarvis Street Baptist; Bond Street Congregational; and the Church of the Ascension (Anglican). Toronto is the head of the Canadian school system. Its higher institutions include the Toronto University, in Queen's Park; Victoria University, a Methodist institution also in Queen's Park; Trinity College; Baptist College; Knox College; and Upper Canada College, etc. The city maintains an excellent free library of over 100,000 volumes, which has branch libraries; has water-works, gas and electric lighting plants, and electric street railways. Cabinet-ware, iron rails, agricultural implements, stoves, pianos, bicycles, carpets, and shoes are manufactured, and there are shipbuilding yards, foundries, breweries, distilleries, and flour mills; the exports are manufactured lumber, flour, wheat, and other grain. Toronto ranks second among the commercial centres of Canada. The name Toronto, 'place of meeting,' is of Indian origin. The town was founded in 1794 by Governor Simcoe, and incorporated in 1834. It was burned by the Americans in 1813, and suffered severely as the headquarters of the rebellion in 1837, and also from fire in 1849. Population, in 1891, 181,220; in 1901, 207,971.

TORONTO, UNIVERSITY OF. An institution of higher education at Toronto, Can., established in 1827, as King's College. The opening of the college was delayed for fourteen years, and not till 1842 were the faculties of arts, medicine, law, and divinity established. In 1849 the institution assumed its present title, and in 1853 the faculties of medicine and law were abolished and the functions of the institution were divided between the two newly organized corporations of the University of Toronto and University College. By the Federation Act of 1887, the faculty of University College consists of professors in classical languages and literature, ancient history, Oriental languages, English, French, German, and moral philosophy. All other portions of the arts course were assigned to the faculty of the University of Toronto, the lectures of which are open to the students of University College and of all federating institutions. A faculty of medicine was established in 1887; in 1888 the Ontario Agricultural College was affiliated, and subsequently the Royal College of Dental Surgeons, the College of Pharmacy, the Toronto College of Music, the School of Practical Science, and the Ontario Veterinary College became parts of the University. Federated with the university are Victoria University, Knox College, Wycliffe College, Saint Michael's College, and Trinity University (1903). The attendance in 1903 was 1717, including 883 in arts, 494 in medicine, and 340 in applied science, and the whole number of instructors was 146. The library contained about 76,000 volumes and 22,500 pamphlets. The endowment in 1903 was $868,899, the income $231,160, and the total value of property under the control of the institution, $3,503,729. University extension work is carried on by means of lectures delivered throughout the Province of Ontario.

TORPEDO (Lat. *torpedo*, numbness, cramp-fish, torpedo, from *torpere*, to be numb, stupid). A naval torpedo is an explosive device designed to destroy or injure a ship by blowing a hole in her hull at or below the water line. It consists essentially of the explosive charge, the fuse (which ignites the charge), and the case containing these. Torpedoes are of two classes, fixed and moving. Fixed torpedoes are now commonly called *torpedo mines* or *submarine mines.*

Torpedo mines are (1) *self-acting*, and (2) *controlled*, according to the conditions of firing. *Self-acting mines* are *mechanically* or *electrically* fired. The mechanical arrangements are of numerous types, but the most common is a set of pins projecting from the head of the torpedo, any one of which if struck would be driven down upon a fulminate primer in communication with the charge. The *electrically fired* are (1) *simple buoyant* mines, anchored so as to be not less than 5 nor more than 20 feet below water, and (2) *combination ground* mines with a buoyant contact piece or float which is anchored so as to be about the same distance beneath the water as a contact torpedo. In both these types the explosion is caused by the completion of the electric circuit by the driving in of a pin by a ship which strikes the mine or float.

Controlled mines are (1) *automatic* and (2) *observation.* The firing wires for all controlled mines lead to mine stations. For automatic mines this is done merely to secure safety. When the circuit is closed at the mine station the torpedo is not fired, but merely prepared to explode if one of the contact pieces on the shell is pressed down by a passing ship. The *combination controlled* torpedo, like the combination self-acting, is a ground mine with a contact float; it is made ready in the same way as an automatic controlled mine. *Observation* mines are fired by observers who keep the circuit closed at their stations when the ship is on line with torpedoes as seen from their points of view. Therefore, when a ship is directly over a torpedo, the circuits at both mine stations (usually placed so as to give nearly right angle intersection of lines of sight on each torpedo) are closed and the charge is exploded. *Observation mines* may be of the *simple* or *compound buoyant* type or of the *ground* type. The *simple buoyant* mine can only be exploded by the observers; the *compound* type has extra fittings, so that it may be considered as belonging also to the *automatic buoyant* type or *controlled* mine. *Observation ground* mines are *simple* if fitted for explosion by the observers only, and are *combination* if they also have contact floats.

Mines of all the types mentioned are in common use, their various characteristics fitting them to different local conditions. Self-acting mines have the advantages of (1) being comparatively cheap, (2) can be kept in store ready for immediate use, (3) do not require specially trained men or observation mining stations, and (4) *extempore* ones can be easily made. But self-acting mines are all (1) rather dangerous to put out or pick up, (2) the condition of the igniting apparatus cannot be tested after the mine is placed in position, (3) they are as dangerous to friend as to foe when once placed, and (4) the mechanical or electric contact pins may become so overgrown with barnacles as to prevent their operation. After being two months in the water the Spanish self-acting torpedoes (in 1898) were so overgrown with barnacles that none were in a condition in which they would have been exploded if struck by a ship; indeed, two United States ships actually struck them without causing explosion. The objections to this type are evidently so serious as to preclude their use in important channels. In such places, particularly if it is desired to keep open a passage for friendly vessels, observation mines are used. If the water is not too deep, ground mines are laid; but in deep water buoyant mines must be employed. Where the water is very deep and the currents are strong the mining of a channel is very difficult—in some cases it is impossible to lay them so that they can always be operated effectively.

Self-acting mines are usually placed singly and far enough apart to prevent the explosion of one mine from setting off the others by shock. Controlled mines, and particularly the observation variety, are commonly put out in groups, all the mines in each group being exploded simultaneously. When so arranged, each group should be far enough from the others to avoid being exploded by shock. The distance at which sympathetic explosion takes place varies with the character of the explosive and the weight of the charge. Guncotton is commonly use. Its extreme destructive horizontal range, according to General Abbott, U. S. A., is 14.7 feet for a 100-pound charge, 20.5 feet for a 200-pound charge, and 31.7 feet for a 500-pound charge; while the safety interval or distance between mines or groups should be at least eight times the extreme destructive horizontal range.

MOVING TORPEDOES are (1) *controlled* or (2) *uncontrolled.* The *controlled* type are (1) *spar,* (2) *towing,* or (3) *dirigible*—the last-named class being either (1) *extra-mobile* or *locomotive* or (2) *automobile.* The *uncontrolled* type includes (1) *automobile,* (2) *projectile,* (3) *rocket,* and (4) *drifting* torpedoes.

Authorities do not favor greatly *controlled* torpedoes. In the spar type of these weapons the charge was placed at the end of a spar rigged out from a boat or ship, and torpedoes of this sort were much used in the Civil War; the rapid-fire gun sounded their death-knell. The *Harvey towing* torpedo (and its modifications) was towed in a spar at the end of a hawser, its shape and steering vanes keeping it well out on the quarter of the ship using it. Its defects are apparent and it is obsolete. The *extra-mobile* or *locomotive* torpedo has an external source of power supplied through wires which are also used in carrying the steering force. Some few of these are still 'officially' in service, such as the *Brennan* and *Sims-Edison,* but they are not much in favor. The *Brennan* is propelled by two wires which are reeled up in the torpedo. By hauling on them they unreel and rotate twin screws. Steering is effected by varying the tension on the port or starboard wire. The *Sims-Edison* torpedo is propelled and steered by electricity from an external source which is supplied to the torpedo through a wire cable which is unreeled as the torpedo advances. The *automobile controllable* torpedoes, of which there were many varieties, carried their own source of power, which was usually compressed air or carbonic acid gas, and were all electrically steered, the current passing through a light cable which was unreeled as the torpedo moved ahead.

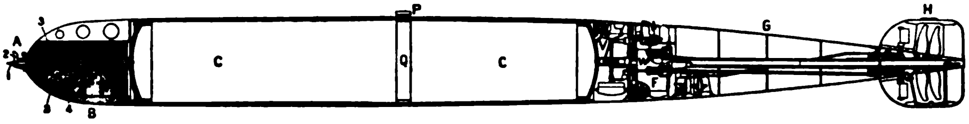


FIG. 1. WHITEHEAD TORPEDO.

The *projectile* type of *uncontrollable* torpedoes is fired from a submarine gun (q.v.). It has never proved satisfactory as a weapon, but it received its most successful development at the hands of Ericsson, who was able to give it a reliable range of about 150 yards. The short range of the submarine gun was its fatal defect and caused its condemnation. *Rocket* torpedoes have usually been fitted to move along the surface of the water, the propelling force being the reaction from the gas escaping from the rear end. As they are very erratic in their movements when the water is smooth and cannot be used at all when it is rough, they have never had much vogue. Submerged torpedoes propelled by rocket tubes have been even less successful; they lack the speed of the surface type and are nearly as erratic as regards their course. *Drifting* torpedoes are merely self-acting buoyant mines set adrift.

are identical in general design and similar as regards details, though the body of the Whitehead has a steel shell or outer case, while that of the Schwartzkopf is made of bronze. The details of a Whitehead torpedo are shown in the accompanying plans. In Fig. 1, A is the *war-nose;* B is the *war-head* (an exercise head without explosive charge or war-nose is used in ordinary torpedo target practice); C is the *air-flask* containing the compressed air—its shell is thicker than that of the rest of the torpedo; P is the *guide stud* for holding the torpedo in position in the tube; Q is a *strengthening band* to support the guide stud; V is the *balance chamber;* F is the *engine compartment;* G is the *tail;* H is the *tail-frame;* 1 is the firing-pin; 2 is one blade of the releasing screw. B, the *war-head,* contains the *explosive charge,* 3, of wet guncotton, while 4 is a small *priming charge* of dry guncotton in a hermetically sealed case inserted in the front end of the war-head before screwing in the war-nose. In Fig. 2, 6 and 8 are the *charging* and *stop valves* for charging the torpedo; T is the *depth regulator* which connects by the *bell-crank lever* M to the *regulator spring,* which is pressed by the hydraulic piston, 16; the hydraulic piston receives the water-pressure on its after side as the engine-room (F) is open to the sea; the hydraulic piston operates small levers pressing against a lever pivoted on the pendulum (17), and the motion is transmitted through the rod N to a crank and thence to the steering engine (18), which operates horizontal rudders (not shown) by means of the rod 24; D is the *operating valve group* which controls the supply of air to the *engine,* W; 10 is the *starting lever;* E is the *releasing mechanism;* K is the *Obry gear,* in which 20 is the *gyroscope* wheel; 13 and 14 are the *propellers;* 15 is the *bevel gear,* which permits the two propellers to be driven in opposite directions; and 22 are the rudders actuated by the Obry gear. This latter by means of its gyroscope wheel (which always keeps in one plane) operates the little rudders (22) and brings the torpedo back to its original direction if it is deflected from any cause.

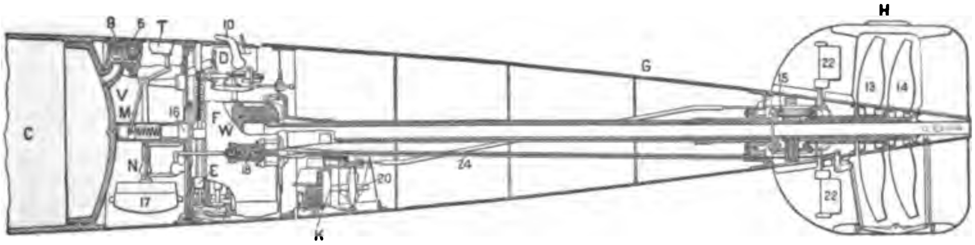


FIG. 2. PROPELLING AND STEERING MECHANISM OF WHITEHEAD TORPEDO.

We now come to the class of moving torpedoes which is most in use, the *automobile* or 'fish' type. There are many varieties, but only three are actually in service, the *Whitehead, Schwartzkopf,* and *Howell.* The first and second of these

The Howell torpedo resembles the Whitehead in all its features except the propelling mechanism. The forward compartment is the *war-head.* Next in rear is the *propelling compartment,* then comes the *buoyancy chamber* containing the *depth regulating mechanism,* and lastly, the after compartment which contains the steering mechanism for both horizontal and vertical rudders. The source of propelling power is a heavy fly-wheel so designed as to have most of its weight near the periphery. By means of a steam turbine connecting to a clutch projecting barely through the shell of the torpedo this wheel is spun up until its speed is 9000 revolutions per minute or 150 revolutions per second. This gives ample power for a long and fast run if it could all be utilized, but up to the present it has been found impracticable to get the power to the propellers fast enough. The propellers are not on one shaft as in the Whitehead, but on two, each connecting to shafts driven by gearing from the fly-wheel. In addition to the simplicity of the form of power, the fly-wheel acts as a gyroscope and strongly resists any force tending to force the torpedo out of the plane in which it was originally launched. The Howell is still in service in the United States Navy, but the development of the Obry gear in the Whitehead has so improved the directive force of the latter that its otherwise superior qualities have caused it to displace the Howell in all new ships.

It is not unlikely that attempts to employ torpedoes or mines were made in the early days of gunpowder, but the first occasion on record in which they were used was in 1585, when an Italian engineer by the name of Gianibelli (q.v.) partially destroyed a bridge across the Scheldt at Antwerp by means of small vessels each carrying a considerable quantity of gunpowder which was exploded by clockwork mechanism. Nothing more is heard of torpedoes until 1730, when the French scientist Desaguliers made some experiments with some of the rocket type which were fired under water and with which he is said to have destroyed several boats. The first torpedoes to be used in war against ships were designed by an American, Capt. David Bushnell, who also built the first submarine torpedo boat, though not the first submarine boat. After making numerous successful experiments Captain Bushnell made three attempts to destroy British men-of-war. In the first, Sergeant Lee used Bushnell's submarine boat (see TORPEDO BOAT, SUBMARINE, for description and illustration), and actually got under H.M.S. *Eagle,* but failed to attach and explode his torpedo, owing to inexperience in handling his novel craft and the bluntness of the screw he tried to use. The second attack was made on H.M.S. *Cerberus* by drifting torpedoes; this failed, but one of the torpedoes was picked up by the crew of a prize schooner astern of the *Cerberus* and, exploding on board, killed three men, destroyed a boat, and injured the schooner. The fourth attempt, also at New London, was the celebrated 'Battle of the Kegs,' and it failed because the British ships had hauled in to the wharves to avoid the ice; but it created much confusion and alarm among their crews. The next man to take up torpedoes seriously was Robert Fulton, who began his experiments on the Seine in 1797. His first attempts were chiefly failures, but in 1801, at Brest, he destroyed a small vessel with a submarine mine containing twenty pounds of gunpowder. This is believed to be the first vessel sunk by a torpedo, but he afterwards succeeded in several instances, and where the attack failed it was owing to the movement of the vessel from above the torpedo and not to defects in the torpedo. In one instance a British brig was destroyed by two torpedoes made by him containing 180-pound charges of gunpowder fired by clockwork. In 1812 and 1813 another American, Mr. Mix, made unsuccessful attempts to blow up British ships. In 1820 Captain Johnson, an Englishman, with a submarine boat attached a torpedo to the bottom of a vessel and exploded it. In 1829 Colonel Samuel Colt began his torpedo investigations, developed the electric firing of mines in 1842, using in one instance wires forty miles long with complete success.

In the Civil War in America the torpedo came quickly to the front as a serious weapon. The few ships of the Confederates offered little opportunity for the use of torpedoes by the Federals, but the great fleet of the latter and the necessity which often compelled the vessels to operate in narrow waters gave a multitude of chances which their enterprising antagonists were quick to seize. The unsuccessful attempts were hundreds in number, but during the course of the struggle 7 Federal armor-clads, 9 gunboats, 6 transports, and 1 cruiser were sunk or destroyed, and 2 armor-clads, 3 gunboats, 1 transport, and 1 large cruiser were seriously injured. Of the latter, 1 cruiser and 1 armorclad were attacked by boats using spar torpedoes. The only important Federal success was the destruction of the armorclad *Albemarle* by Lieutenant Cushing, who also used a spar torpedo.

While all this was going on Captain Lupuis of the Austrian Navy and Mr. Whitehead began the development of the movable torpedo. The idea of a small, self-propelled boat carrying an explosive charge and directed from a distance had occurred to Captain Lupuis in 1860, but it was not until 1864 upon his association with Mr. Whitehead that any craft of the sort were built. Mr. Whitehead, who was an English engineer acting as superintendent of engineering works at Fiume, took hold of the project with great interest. He soon gave up the plan of using directing wires, and bent his energies to the development of a completely automatic device. In 1868 the first official trial was held before a board of Austrian officers, and its report resulted in the adoption of the weapon in the Austrian service, although the speed attained was only about seven knots. From this time to the present the improvement has been continuous, the speed rising to 35 knots and the directive force becoming almost absolutely certain when the conditions are favorable. All naval powers now use the Whitehead or its equivalent, the Schwartzkopf, and many (including the United States) have purchased the right to manufacture them.

Shortly after Whitehead's successful experiments Captain Harvey, R.N., brought out his *towing torpedo,* which had a vogue wholly unwarranted by its performance, but it was pleasing from its simplicity. About 1870 Commander (now Rear-Admiral) Howell, U. S. N., conceived the idea of applying the principle of the gyroscope to automobile torpedoes for the purpose not only of steering them, but to afford motive power as well. His torpedo was gradually improved until in 1898 it attained a speed of about 28 knots with almost perfect directive force. The application of the Obry gyroscopic gear to the otherwise perfected Whitehead, however, drove the Howell out of the field, and it is now practically unused.

In 1873, while the success of the Whitehead remained uncertain in many minds, Mr. J. L. Lay brought out his first controllable torpedo, propelled by carbonic acid gas and directed by electricity through wires paid out from a reel in the torpedo as it advanced. The Lay was followed by a host of similar inventions, the Lay-Haight, Patrick, Nordenfelt, Brennan, Sims-Edison, and others; but, although some are still officially in service, none are regarded as of much use in modern warfare. Controllable torpedoes, steered by wireless induction currents, have been under experiment.

The first Whitehead to be fired with hostile intent was directed at the Peruvian monitor *Huascar* by the British cruiser *Shah*, which sought to capture or destroy the former to prevent her from further lawless attacks on British vessels. The shot failed because fired at too great a distance. In 1891 two Chilean Government torpedo vessels sank the insurgent armorclad *Blanco Encalada* with Whitehead torpedoes, and during the Japan-China War several vessels were destroyed by them. The recent improvements in the range, speed, and directive force of Whitehead torpedoes, as well as in torpedo boats and firing appliances, has caused a considerable change in naval opinion, which now is inclined to regard the Whitehead as a most dangerous weapon; still it is not, as many uninformed people seem to think, likely to take the leading part in future wars, because the danger from it may be greatly reduced by careful disposition of ships at night, proper scouting, and increasing vigilance. Moreover, since it is only useful against vessels and cannot support operations against coasts, fortifications, or men, it can never hope to displace the gun and the well-protected gun-carrying warship.

BIBLIOGRAPHY. For further information, consult: Sleeman, *Torpedoes and Torpedo Warfare* (2d ed., Portsmouth, Eng., 1889); Armstrong, *Torpedoes and Torpedo Vessels* (2d ed., London, 1902); *Annual of the Office of Naval Intelligence* (U. S. Navy); Brassey, *Naval Annual* (Plymouth); Buchard, *Torpilles et torpilleurs* (Paris, 1889); *Proceedings of United States Naval Institute* (Annapolis, quarterly). See articles on TORPEDO BOAT; TORPEDO BOAT, SUBMARINE; TORPEDO DIRECTOR; etc.

TORPEDO, or ELECTRIC RAY. A ray (q.v.) of the family Narcobatidæ, which inhabits warm seas, and often is of large size. These rays have a broad, flat body with a comparatively slender tail, and are of interest because of the electrical powers which they possess. (See ELECTRIC FISH.) There are about 15 species, of which the best known is *Torpedo marmoratus* of Southern Europe. A similar species, the 'crampfish,' or 'numbfish' (*Torpedo occidentalis*), occurs on the Atlantic coast of the United States, and is said to attain a weight of 200 pounds. The same, or a very similar species is found on the coast of California. See Plate of ELECTRIC FISH.

TORPEDO BOAT. A small war vessel fitted to use the torpedo as its primary weapon of attack. The principal requirements of a torpedo boat are high speed, efficient means of launching torpedoes, handiness, and fair seaworthiness. To attain these essentials the boats are long, slender, very lightly built, and low in the water. The torpedo tubes are pivoted on deck—on small boats on the fore-and-aft midship line; on larger boats, near the side. Modern torpedo boats belong to four classes: (a) *torpedo boat destroyers;* (b) *sea-going* boats; (c) *harbor* boats; and (d) *portable* boats carried by men-of-war. Torpedo boat destroyers are here classed with torpedo boats because of similarity in general design and because they will undoubtedly be used for torpedo attack in the same manner as the smaller craft—from which they differ little except in size and the possession of a battery sufficiently powerful to quickly sink and destroy boats of the lesser dimensions. They vary in size from 250 to 600 tons. The torpedo boat proper carries very few and very small guns. Sea-going boats are of 100 to 250 tons; harbor boats (capable of going to sea in moderate weather) of 30 to 100 tons; and portable boats of from 5 to 15 tons. The speeds are in somewhat similar ratio, destroyers having 26 to 35 knots; sea-going boats, about 25 knots; harbor boats, 20 to 25 knots; and portable boats, 13 to 17 knots.

Torpedo boats can only hope to be successful when attacking under cover of night or of thick fog, and several should attack a ship simultaneously and from different directions. The defense against them consists of picket boats, torpedo nets (q.v.), rapid-firing guns (q.v.), and searchlights (q.v.). Although it is difficult to sink a well-built modern battleship by torpedo attack, it is always possible, and the knowledge of this fact exercises a great moral effect. All maritime nations possess torpedo boats. (See NAVIES.) In 1903 the United States boats were, with one or two exceptions, quite new, and averaged much larger than those of the same class in foreign navies. The American destroyers are much more heavily armed than the foreign ones. Sixteen of them carry two 3-inch guns and five 6-pounders, and the other four have four to seven 6-pounders. Many of the foreign destroyers carry only five or six 1-pounders or 3-pounders; while, aside from a few of the latest British boats, none carries more than one 3-inch.

In its earliest form the torpedo boat contained merely a large quantity of powder and was itself destroyed by the explosion. Craft of this type were used by Gianibelli at Antwerp in 1585. (See TORPEDO.) The first evolutionary step developed boats which carried torpedoes that were designed to be attached to the bottom of the enemy's ship. All of this type were submarine. (See TORPEDO BOATS, SUBMARINE.) The first surface boats appeared during the American Civil War and the first partial success was achieved (October, 1863) in an attack by a Confederate boat on the Federal armorclad *New Ironsides*, in which the latter was slightly injured. Practically all of the torpedo boats of the war used 'spar' torpedoes, which were carried at the end of a long spar or boom rigged out beyond the bow; and nearly all were ordinary steam launches or pulling boats, though the boat which attacked the *New Ironsides* and one or two others were specially built craft with nearly submerged hulls. In 1873 the first fast (speed, 15 knots) specially designed torpedo boat was built by Thornycroft of Chiswick, England, for the Norwegian Government and was fitted for using the Harvey towing torpedo, then in much favor. In the next year both Thornycroft and Yarrow (of Poplar, near London) constructed boats for various foreign governments, and they built several in the ensuing year, but none for Great Britain. About the same time Herreshoff completed a very fast boat for the United States Navy. In 1877 Herreshoff brought out the first boat fitted to use Whitehead torpedoes, and although many subsequent boats were designed to carry spar torpedoes, the Whitehead rapidly made its way, so that by 1880 it had practically displaced all rivals except the Howell and Schwartzkopf, which were of somewhat similar type.

The advent of the 'destroyer' class of boat was brought about by the realization of the inadequacy of the existing means of defense against torpedo attack. The first boat was completed for the British Navy in 1893. Experience with these craft demonstrated their value both as scouts and picket boats against torpedo boat attack, and also showed that under many circumstances they were available and desirable as torpedo boats.

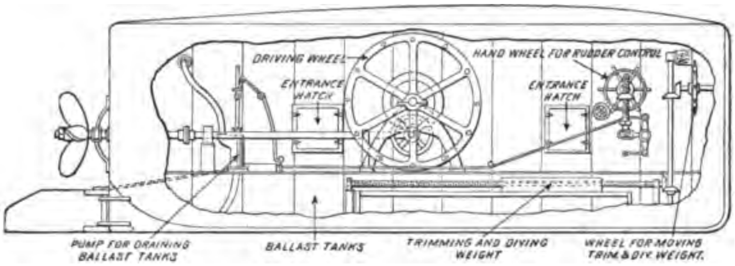
BIBLIOGRAPHY. For further information, consult: Sleeman, *Torpedoes and Torpedo Warfare* (2d ed., Portsmouth, England, 1889); Armstrong, *Torpedoes and Torpedo Vessels* (2d ed., London, 1902); Johnson, *Defense of Charleston Harbor* (Charleston, 1890); Scharf, *History of the Confederate Navy* (New York, 1887); *Annual* of the Office of Naval Intelligence (United States Navy Department, Washington, current); Brassey, *Naval Annual* (Portsmouth, annual); Buchard, *Torpilles et torpilleurs* (Paris, 1889). See also articles on TORPEDO; TORPEDO BOAT, SUBMARINE; and TORPEDO NET.

TORPEDO BOAT, SUBMARINE. Modern submarine torpedo boats are of two kinds, the *submerged* and the *submergible.* The submerged, when in light cruising condition, moves with only a small percentage of the hull above water; the submergible cruises on the surface much like an ordinary torpedo boat, which it resembles externally. The difference in principle between the two types is slight, but in construction details it is very marked. Submerged boats are usually nearly cylindrical with pointed ends, the general shape being much like that of a Whitehead torpedo. Submergence is effected by admitting water to the ballast tanks or by means of inclined rudders or both. *Submergible* boats have two hulls, one inside the other. The outer hull resembles closely that of the ordinary torpedo boat, but has as few projections as possible rising from the general outline, in order to present a smooth surface when submerged. Inside this there is a second hull of nearly circular cross-section and as large as the shape of the outer boat permits. To effect submergence water is first admitted to the space between the hulls, and this brings the boat to the 'awash' condition. Further submergence is effected by permitting the ballast tanks to fill. The advantages of each type are apparent. The submerged boat is ready for nearly instant service, but cannot cruise with comfort to the crew. The submergible boat affords fair speed and comfort when cruising, but considerable time is required to effect its submergence. The section (Fig. 4) of the Holland submarine boat shows the general features of a submerged boat; similar boats have also been built for the British Navy. France, which is building more submarines than any other nation, is the only one using the submergible boats, and they form but a small part of those she has completed or under construction. For the number of boats completed and under construction in the various navies of the world in 1903, see NAVIES.

The difficulties in the way of submarine navigation are: (a) difficulty of securing safety; (b) of obtaining a fair speed; (c) of steering; (d) of securing habitability; (e) of insuring stability; to which is to be added, for submarine torpedo boats, the difficulty of directing and discharging the torpedo. In the present state of development submarine boats can be made fairly safe. The problem of reaching a speed in excess of 10 knots when wholly submerged is a difficult one. Storage batteries are too heavy (at least all types now known) for the purpose of furnishing sufficient power; steam is inadmissible for obvious reasons; and the only practicable machine seems to be an explosive motor developing a high pressure in the engine. So far no efficient means of keeping the exhaust gases from escaping into the boat has yet been devised; and even if such means were found it is possible that the escaping bubbles and the smell would enable the course of the boat to be ascertained and followed. As to steering and directing the course, there remain several imperfectly solved problems. It is impossible when under water to see more than a few feet ahead with the boat at rest, and the difficulty increases with the speed. Even when near the surface of the water the hull of a large ship is undiscernible beyond 100 feet. A sensitive compass with adequate directive force is possible only if the hull is made of copper, bronze, aluminum, or some other non-magnetizable metal. The most promising device is the periscope, which (like a camera obscura) consists of a tube with a prism or inclined mirror at the upper end with a reflecting table below. The upper part of the periscope is designed to project several feet above water when the boat is entirely submerged. The unsteadiness of the boat, however, interferes seriously with the effectiveness of this instrument; moreover, the projecting tube may betray the boat's position. In place of a compass a gyroscope has been experimented with, but the results were not satisfactory. All boats are fitted with small conning towers projecting a short distance above the hull and having glass covered peep holes of considerable size. This conning tower can be used when cruising at the surface and its top may be opened if the water is very smooth. In most boats the opening in the top of the conning tower forms the principal way of ingress and egress.

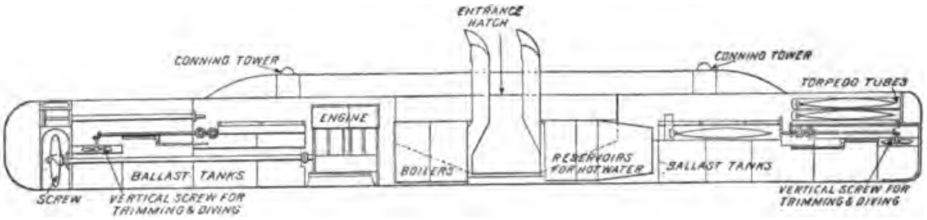
To attain a reasonable habitability in a submarine boat is very difficult indeed. The boats are not easily susceptible of being warmed or cooled; in fact, few attempts have been made in either direction, so that in very warm water or in very cold it is possible to remain in the boats only a very short time without suffering from the unsuitableness of the temperature. So far as the vitiation of the air due to the breathing of the crew is concerned, the problem may be regarded as practically solved; but storage bat-

SUBMARINE TORPEDO BOATS


DRIVING WHEEL
HAND WHEEL FOR RUDDER CONTROL
ENTRANCE HATCH
ENTRANCE HATCH
PUMP FOR DRAINING BALLAST TANKS
BALLAST TANKS
TRIMMING AND DIVING WEIGHT
WHEEL FOR MOVING TRIM.& DIV. WEIGHT.

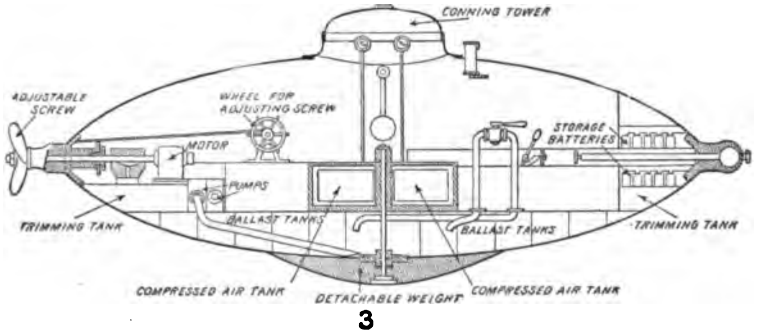
1

"PLONGEUR-MARIN"—GERMAN—1851



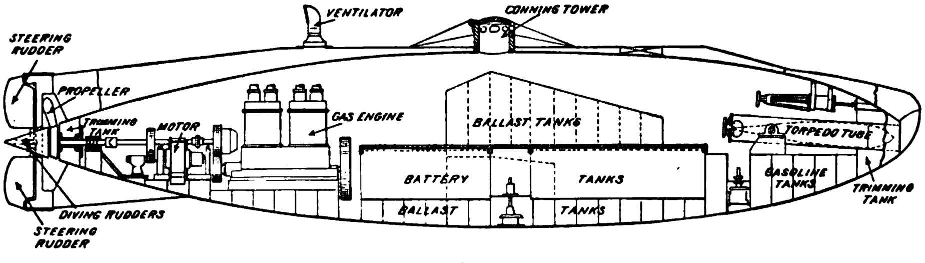
2

NORDENFELDT "No. 4"—ENGLISH—1887



3

"GOUBET"—FRENCH—1889



4

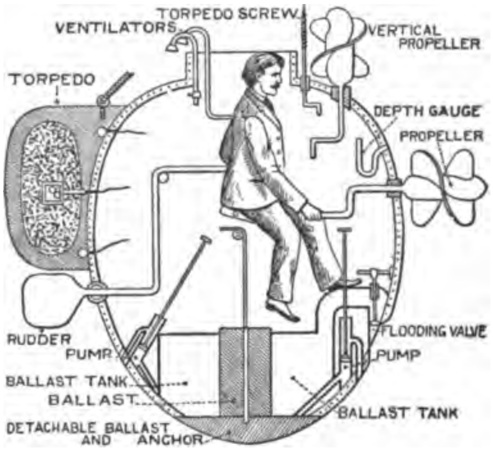
HOLLAND "FULTON"—UNITED STATES—1901

teries, steam motors, oil motors, and oil give off gases which are not only annoying and injurious, but may prove dangerous. It may be possible to reduce troubles of this sort to satisfactory limits by inclosing the machinery in air-tight casings, but in the handling and inspection some gas is sure to escape. There can be no cooking, no proper sleeping accommodations, no proper water-closets, and the natural light is feeble. The motion is as trying as it is on a surface boat. A short consideration of these things is sufficient to show that the ease of securing fair habitability increases with the size of the boat, to which of course there is a limit.

The conditions affecting the stability of an entirely submerged vessel differ considerably from those affecting the stability of one floating on the surface. (See SHIPBUILDING.) Since the sectional area of the immersed body remains unchanged at all angles of heel, the position of the centre of buoyancy is constant; the righting moment therefore grows more slowly as the boat heels. By suitable ballasting or arrangement of weights adequate transverse stability is not very difficult to attain. But longitudinal stability is quite another matter. Any possible assistance from ballasting or the arrangement of permanent weights is insignificant, and the change of trim due to the using of fuel and shifting of weights (torpedoes, men, liquid in partly filled tanks, etc.) is a very serious matter. It is counteracted by the use of horizontal rudders, or shape of the hull, or quickly shifting water-ballast. If the boat has a slight surplus buoyancy the tendency to rise to the surface can be counteracted by vanes or the shape of the head which tends to make the boat descend so long as it is moving. But as the effect of hull shape or permanent vanes changes with the speed, while the buoyancy effort is constant, horizontal rudders are a necessity. From these facts it follows that short, deep, and broad boats are most stable, but such a shape is incompatible with speed.

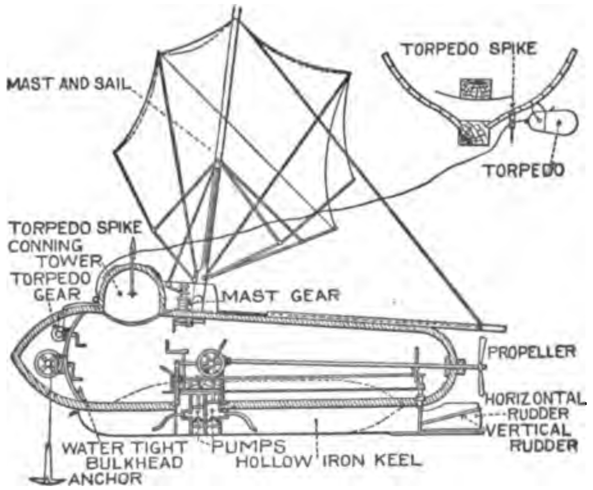
The difficulties experienced in discharging torpedoes are closely connected with the question of stability. In addition to confined space in which torpedoes are operated, and the difficulty of giving them the correct direction at the moment of firing, it is necessary that the boat should be nearly horizontal when the torpedo is fired, else the latter will take too deep a dive or rise to the surface at the beginning of its run. The shock of firing and the sudden release of weight at the bow as the torpedo leaves it causes great longitudinal disturbance in the boat, and may bring it to the surface, while the change in permanent trim adds to the difficulty of maintaining a constant depth.

The submarine torpedo boat as developed in 1903 was certainly far from a perfect weapon, being of little use except in smooth water, difficult to use at night, and having a very short radius of action. But, under favorable circumstances, it was thought that it might achieve a great success, while the knowledge of the presence of submarines in a port cannot but have a powerful effect upon the nerves of the officers and crews of blockading vessels.



BUSHNELL'S BOAT (1775).

When or by whom was built the first submarine boat will probably never be known. It is said that Alexander the Great was interested in submarine navigation, while subaqueous attack of vessels was studied at least as early as the thirteenth or fourteenth century. M. Delpeuch states that some English ships were destroyed in 1372 by fire carried under water. In the early part of the seventeenth century submarine boats were numerous, and in 1624 Cornelius Drebbel exhibited to King James I. on the Thames a submarine boat of his own design. By 1727 no less than 14 types of submarines had been patented in England alone. In 1774 Day began experiments with a submarine boat at Plymouth, England, losing his life in the second submergence trial. In the following year David Bushnell built his first boat, with which Sergeant Lee attacked H. M. S. *Eagle* in New York Harbor. Lee actually got under the ship, and the attack failed only because the screw by which the torpedo was to be attached to the *Eagle's* bottom was not sharp enough. Robert



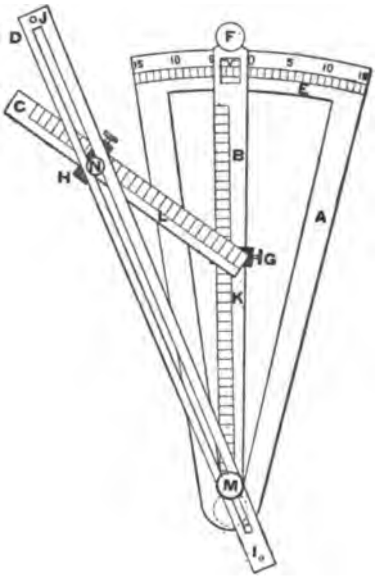
FULTON'S NAUTILUS (1801).

Fulton's experiments in France and America (1795-1812) demonstrated that a vessel could be built which could descend to any given depth and reascend at will. Plunging mechanism was devised about the middle of the eighteenth century, but Fulton developed the vertical and horizontal rudders and provided for the artificial supply of air. A form of periscope existed in 1692 and an improved kind was patented in 1774; in 1854 Davy still further developed it. Phillips's wooden boat on Lake Erie was crushed by the water pressure, and the same fate befell Bauer's iron boat *Plongeur-Marin* (Fig. 1 on Plate) at Kiel in 1850. In 1863 McClintock and Howgate built a semi-submarine hand-propelled boat for the attack on the Federal fleet, but it sank four times, each time drowning the entire crew of eight men. In the same year several larger boats propelled by engines were commenced in Europe, and these at intervals were followed by others designed by Hovgaard, Goubet, Zédé, Nordenfeldt, Tuck, Holland, etc. The French Navy began experimenting with submarine boats about 1885. The *Gymnote* was built in 1888 and the *Gustave Zédé* in 1893. The *Morse* was commenced in 1894, but remained uncompleted until 1899, pending additional experiments with the *Gymnote* and the *Zédé*. In that year the construction of submarines was actively commenced, 10 being launched in 1901. In 1886 Nordenfeldt built two large submarines for Turkey, but little was ever done with them after they passed into Turkish hands. In 1889 Spain built the *Peral*, Portugal following with the *Plongeur* in 1892. Italy built the *Delfino* in 1895. The United States had the submarine boat under consideration for several years. The first boat ordered (about 1895) was never completed, but seven of the Holland type were ordered in 1900 and one was purchased when nearly complete early in that year.

Consult: Sleeman, *Torpedoes and Torpedo Warfare* (2d ed., Portsmouth, England, 1889); Delpeuch, *La navigation sous-marine à travers les siècles* (Paris, 1902); Burgoyne, *Submarine Navigation* (London and New York, 1903); Buchard, *Torpilles et torpilleurs* (Paris, 1889); *Proceedings of the United States Naval Institute*, particularly No. 100, December, 1901 (Annapolis, current).

TORPEDO BOAT DESTROYER. See TORPEDO BOAT.

TORPEDO DIRECTOR. An instrument designed to indicate the proper moment at which to fire a torpedo from a ship or torpedo boat. It is placed on deck, or in a port or air-port giving a clear view of the enemy. The type shown in the sketch is for a bow torpedo tube on a torpedo boat; a broadside director differs chiefly in having a greater arc of train for the arm B. The instrument consists of a metal sector, A, graduated along the limb E into degrees of arc. On this are three movable arms, B, C, and D. B and D are pivoted on A at the centre of the arc E, while C pivots on the sliding block G. B and C are graduated into similar and equal divisions, representing the speed of the torpedo and the enemy respectively. The arm B is first set parallel to the axis of the torpedo tube, and the block G is set at the division of the scale, K, corresponding to the speed of the torpedo. The block H is set at the division of the scale L which corresponds to the estimated speed of the enemy, and the arm C is swung around until parallel to his supposed course. Then the clamp-screws M and N are screwed down. The direction MN (or IJ) is therefore the direction in which the enemy must be in order to be hit by the torpedo moving in the direction MF, if the estimated speeds of enemy and torpedo are correct. The moment that the enemy is on the proper bearing is ascertained by looking over the sights I and J.



TORPEDO DIRECTOR.

TORPEDO NET. A net made of heavy wire rings connected with one another by small steel rings and surrounding a vessel of war below water as a defense against torpedoes. The net is made up in sections about 15 by 20 feet in size, and these sections join to make the total protection, which is divided into three parts called the 'main defense,' 'bow defense,' and 'stern defense.' All except the main defense are frequently omitted, and it only can be carried if the vessel is moving slowly, while no nets are of any use if the ship is moving at fair speed. The type of net most in favor is that devised by Mr. Bullivant, an Englishman in the employ of the Admiralty. The Bullivant net is made of wire rings or grommets (see KNOTTING AND SPLICING) six inches in diameter connected to each other by galvanized steel rings. Each section weighs about 400 pounds and has a heavy piece of chain at the foot to keep it as nearly vertical as possible when the ship is under way or anchored in a current; the sections are joined to each other by stout wire lashings. The upper edge of the net has small rings sliding on a wire rope, called a jackstay, which is shackled to the outer ends of the booms. Each of the booms is of hollow steel tubing, and is about 30 feet long. The inner end is fitted with a ring which passes through another ring at the upper end of a pivot bolt which works in a lug secured to the ship's side. The outer end is fitted with two topping lifts and two guys. The booms are placed about 45 feet apart. When not in use the booms are swung in alongside and with the net landed on a sort of shelf, or if there is no shelf the net is drawn up snugly and the whole lashed to eyebolts on the ship's side. Torpedo nets are not regarded with favor by many naval officers, as they cannot be used except when at anchor, and many torpedoes are now fitted with net cutters which enable them to get through.

TORPEDO SCHOOL. See Naval Schools of Instruction.

TORPEDO STATION. A torpedo supply station and headquarters for torpedo boats. The United States naval torpedo station is on Goat Island, Newport Harbor. All torpedoes for the navy are sent there from the makers and are inspected, tested, and put into adjustment for service. In addition, all necessary supplies for working torpedoes are made there, together with torpedo mines, guncotton, primers for heavy guns, and certain other ordnance supplies and fittings. There is also a small factory for the manufacture of smokeless powder, the larger naval powder factory being at Indian Head proving ground. Some of the schools for officers and enlisted men of the navy are also located at the torpedo station—the petty officers' school, torpedo school, electrical school, school for training torpedo boat firemen, and the torpedo school for officers.

TORQUATO TASSO, tôr-kwä'tô täs'sô. A tragedy by Goethe (1790) suggested by a visit to Sorrento and Sicily. It deals with the sorrows of an idealistic poet in a jealous artificial court, and in its emotional element is largely autobiographical.

TORQUAY, tôr-kē'. A fashionable health resort and watering place on the south coast of Devon, England, occupying a cove on the north side of Tor Bay, 23 miles south of Exeter (Map: England, C 6). Marble works and terracotta manufactures are its industrial specialties, and it is an important yachting station. Its harbor has an area of 36 acres. Till the beginning of the nineteenth century Torquay was an assemblage of fishermen's huts. About that time the advantages of its climate and freedom from fogs caused it to be resorted to by consumptive patients; and it soon attained a European celebrity. Saint John's, a fine church of modern Gothic architecture, the town hall, a museum, a theatre, and an opera house are the chief structural features. Torquay was incorporated in 1892. It owns valuable property, municipal waterworks, electric lighting plant, pleasure grounds, baths, a sanatorium, and a refuse destructor, and supports technical schools. Kent's Cavern, discovered in 1824, and the Brixham Cave, discovered in 1858, are rich in fossils, and have supplied the earliest English evidences of prehistoric man. After the defeat of the Spanish Armada, Don Pedro's galley was brought into Tor Bay, and an old thirteenth-century building, where the survivors were housed, is known as the 'Spanish barn.' Torquay was the landing place of William of Orange in 1688. Population, in 1891, 33,825; in 1901, 33,625.

TORQUEMADA, tôr'kâ-mä'dâ, Juan de, also known by the Latinized form Turrecremata (1388-1468). A Spanish theologian and cardinal, born at Valladolid. He entered the Dominican Order in 1403 and completed his studies at the University of Paris in 1424. After presiding over houses of his Order at Valladolid and Toledo, he was made master of the sacred palace by Eugenius IV. in 1431, and employed in various important negotiations. He was made a cardinal-priest in 1439, exchanging his title later for the cardinal-bishopric of Albano and in 1464 for that of Sabina. He devoted the large revenues of various preferments which he held to church building and works of charity, but attained greater renown by his numerous theological writings, many of which dealt with the controversies of the day. He took part in the councils of Constance, Basel, and Florence, and drew up the plan for the union between the Greek and Latin churches at the last named. Consult Lederer, *Der spanische Cardinal Johannes von Torquemada* (Freiburg, 1879).

TORQUEMADA, Tomas de (1420-98). A Spanish Inquisitor-General. He was born at Valladolid, of the same family as that to which the famous theologian, better known as Turrecremata, belonged. He entered the Dominican Order, and became prior of the monastery at Segovia, a post which he held for twenty-two years. In 1478 the Inquisition was reëstablished in Spain by Ferdinand and Isabella, and four years later some assistants were given to the first Inquisitors. Torquemada was among these, and so distinguished himself by his zeal that in 1483 he was named by Sixtus IV. Grand Inquisitor for Castile and Aragon. He erected four tribunals, at Seville, Cordova, Jaén, and Villa Real, the last of which was afterwards transferred to Toledo. The Grand Inquisitor was assisted by a council of theologians and jurists named by the King, but deriving their jurisdiction from the Inquisitor-General, in virtue of the latter's Papal authority. In political and legal questions he was obliged to act only in concert with them, but merely asked their advice in theological matters. Torquemada drew up the code of procedure, which was confirmed by the Pope, though the Holy See steadily impressed upon the Inquisitors the necessity of exercising charity toward those who were accused of heresy, and frequently mitigated the rigor of their sentences, or, if the matter was dealt with independently by the Spanish Government, complained strongly. Torquemada took a prominent part in the expulsion of the Jews from Spain. Toward the end of his life he retired into the Dominican monastery of Avila, where he died. Consult de Molenes, *Documents inédits: Torquemada et l'Inquisition* (Paris, 1897). As a typical representative of the Spanish Inquisition, Torquemada has been frequently condemned by Protestant historians for wanton cruelty. For a fuller discussion of the charges made by them, see Inquisition.

TORQUES (Lat. *torques*, *torquis*, twisted neck-ring, necklace, collar, from *torquere*, to rack, twist, torment). A species of gold ornament, meant to be worn round the neck, which was much in use in ancient times, both among Asiatic and North European nations. It consisted of a spirally twisted bar of gold, bent round nearly into a circle, with the ends free, and terminating in hooks, or sometimes in serpents. Numerous examples of the torques have been dug up in Great Britain and Ireland, as well as in France, and are to be found in archæological collections.

TORRE DEL GRECO, tŏr'rā dĕl grā'kō. A seaport and bathing resort in the Province of Naples, Italy, situated at the base of Vesuvius, 7 miles southeast of Naples (Map: Italy, J 7). The town has been largely rebuilt since the great eruption of Vesuvius in 1861. It manufactures wine, coral-ware, lava-ware, and rope. There are shipbuilding yards. The inhabitants are largely engaged in the coral, tunny, oyster, and sardine fisheries. Torre del Greco suffered severely from lava streams in 1631, 1737, and 1794. Population (commune), in 1881, 27,562; in 1901, 33,299.

TORRE DELL' ANNUNZIATA, -än-nōōn'-tsē-ä'tȧ. A seaport in the Province of Naples, Italy, situated at the base of Vesuvius, 12 miles southeast of Naples (Map: Italy, J 7). It makes a specialty of macaroni. There are fine thermal baths. It has a Government arms factory, extensive fisheries, and a trade in wine and lava products. Population (commune), in 1881, 22,013; in 1901, 28,143.

TORREDONJIMENO, -dōn-hē-mā'nō. A town in the Province of Jaén, Spain, 8 miles west of the city of Jaén, on the right bank of the Salado de Porcuña. It is a well-constructed town with regular plazas and wide streets. There are gypsum quarries in the vicinity. Spirits and soap are the chief manufactures. Population, in 1900, 10,044.

TORRE MAGGIORE, mäd-jō'rā. A town in the Province of Foggia, Italy, about 20 miles northwest of Foggia (Map: Italy, K 6). It has a famous Benedictine abbey and large oil refineries. Population (commune), in 1901, 11,054.

TOR'RENS, Lake. A large lake depression in South Australia, situated about 30 miles north of the northern extremity of Spencer Gulf (Map: Australia, F 5). It is about 130 miles long with an average breadth of 20 miles, but is very shallow. In the wet season it receives a number of streams from the Flinders Range, but for a large part of the year it is only a salt marsh.

TORRENS, Henry Whitelock (1806-52). An English writer, born at Canterbury, and educated at Charterhouse, and Christ Church, Oxford. He held various positions in the civil service and in 1837 became one of Lord Auckland's secretaries, but his reputation rests upon his translation of the *Arabian Nights*. The first volume appeared in 1838. The work was never completed, but the existing fragment is considered superior to any later version. His collected works were published by J. Hume in 1854 (Calcutta and London).

TORRENS, Robert (1780-1864). An Irish economist. He is best known as an economist, and as one of the first to state the law of diminishing returns, the modern theories of wealth, and theory of international trade, and is credited with having proposed the separation of the Bank of England into banking and issue departments. His publications include *An Essay on Money and Paper Currency* (1812), *An Essay on the Production of Wealth* (1821), *Letters on Commercial Policy* (1833), *On Wages and Combinations* (1834), and *Tracts on Finance and Trade* (1852).

TORRENS, Sir Robert Richard (1814-84). An English colonial statesman, born at Cork, and educated at Trinity College, Dublin. He went to South Australia in 1840, and in 1857 became Colonial Treasurer and Premier. In the following year were passed the land laws which bear his name, whereby public registration was substituted for conveyancing. (See Torrens System.) In 1863 Torrens retired from Australian public life, returned to England, and in 1868 entered Parliament, where he sat for Cambridge until 1874, but failed to introduce his reform in the land laws. His publications include *The South Australian System of Conveyancing* (1859), and *Transfer of Land by "Registration of Title" as now in operation in Australia under the "Torrens System"* (1863).

TORRENS, William Torrens McCullagh (1813-94). An Irish politician and author, who in middle life (1863) assumed his mother's name of Torrens. He was born at Greenfield, near Dublin, was educated at Trinity College, Dublin, and was admitted to the Irish bar in 1836 and the English in 1855. In 1842 he was one of the founders of the Mechanics Institute of Dublin. Elected to Parliament in 1847, he sat for Dundalk until 1852, was returned in 1857 for Yarmouth, but was unseated on petition, and then sat for Finsbury from 1865 to 1884. He was known for his interest in social questions. He introduced the Artisans' Dwellings Act, and that by which the School Board of London was established. His publications include *The Industrial History of Free Nations* (2 vols., 1846), *The Lancashire Lesson* (1864), *Our Empire in Asia: How We Came by It* (1872), and a *History of Cabinets* (2 vols., 1894).

TORRENS SYSTEM. A system of registration of titles to land introduced into South Australia by Sir Robert Richard Torrens, in 1857, in the Real Property Act drafted by him. The chief novelty of the system is the provision for the guaranty of properly registered titles by the Government. The Torrens system was adopted in most of the Australian colonies, in New Zealand, and British Columbia, and a somewhat similar system was introduced into California and a few other States. See Title, Registration of. Consult: Yeakle, *Torrens System;* Dumas, *Registration of Title Under Torrens System* (1900).

TORRES NOVAS, tŏr'rās nō'väs. A town of the District of Santarem, Portugal, 56 miles northeast of Lisbon. It is in an extensive olive-producing region, and has important oil mills and cotton and linen manufactories. Population, in 1900, 10,738.

TORRES (tŏr'rĕs) **STRAIT.** The channel which separates New Guinea from the Australian continent (Map: Australia, G 1). It is about 100 miles in width. Its navigation, though practicable, is rendered difficult by the innumerable shoals, reefs, and islands. It was discovered by Torres in 1606.

TORRES VEDRAS, vā'dräs. A town in the District of Lisbon, Estremadura, Portugal, on the left bank of the Sizandro, 24 miles northwest of Lisbon on the Lisbon-Figueira railroad. Its population in 1900 was 6891. It carries on some trade in wine. The Lines of Torres Vedras consist of three lines of fortifications, begun by Wellington in 1809 and behind which he retired in October, 1810, before the invading army of Masséna. He held the lines against all the attempts on the part of the French, and in August, 1811, forced Masséna to retreat. The first of these lines, extending from Alhandra, on the Tagus, to the mouth of the Sizandro, on the seacoast, was 29 miles long; the second lay from 6 to 10 miles behind the first and had a length of 24 miles; the third, situated to the southwest of Lisbon, at the very mouth of the Tagus, was very short, being intended to cover a forced embarkation, if that became necessary. The entire ground thus fortified was equal to 500 square miles.

TOR'REY, Bradford (1843—). An American ornithologist and author, born at Weymouth, Norfolk County, Mass. He was educated in the public schools, taught for two years, then entered business in Boston, and in 1886 became a member of the staff of the *Youth's Companion* of that city. Among his books, marked by accurate and discriminating observation and a happy style, are *Birds in the Bush* (1885), *A Rambler's Lease* (1889), *Spring Notes from Tennessee* (1896), and *A World of Green Hills* (1898).

TORREY, Charles Turner (1813-46). An American reformer, born at Scituate, Mass. He graduated at Yale in 1830, studied theology, and became pastor of a Congregational church in Princeton, N. J. Later he had charge of a church at Salem, Mass., but finally gave up his pastoral duties to devote himself entirely to the abolitionist movement. He removed to Maryland, and in 1843, for writing an account of a slaveholders' convention held at Baltimore, he was arrested and thrown into prison. He became an efficient 'official' of the underground railroad, and in 1844 was convicted of having attempted to help slaves to escape and was sentenced to a long term in the State penitentiary. Two years later he died in prison of consumption. His body was taken to Boston, where it was given a public funeral. Everywhere he was hailed as a martyr in the anti-slavery cause, and the words "Torrey's blood crieth out" became a watchword for the abolitionists. He wrote *A Memoir of William R. Saxton* (1838), and *Home, or the Pilgrims' Faith Revived* (1846), a volume of sketches written in prison.

TORREY, John (1796-1873). An American botanist. He was born in New York State, graduated at the New York College of Physicians and Surgeons, 1818; was professor at West Point, 1824-27; in the College of Physicians and Surgeons, 1827-55; at Princeton, 1830-54; chief assayer in the United States Assay Office, New York, 1853-73. His best known publications are: *Catalogue of Plants Growing Spontaneously within Thirty Miles of New York* (1819); *Flora of the Northern and Middle States* (1824); *Flora of the State of New York.* With Prof. Asa Gray he began the publication of *Flora of North America* (1838-43). His valuable herbarium and botanical library he presented in 1860 to Columbia College, in which institution he held a professorship of chemistry at the time of his death.

TORREY, Joseph William (1828-84). An American newspaper man and merchant, born at Bath, Me. He was for a time connected with the Boston *Times* and the *Carpet Bag.* In 1853 he went to Australia, where he entered a commercial house, and in 1859 to China, where he became editor of the *Hong Kong Times* and the *China Mail.* He engaged in commerce, organized the American Trading Company of Borneo, and in 1865 was recognized by the Sultan as Rajah of the Marudu and Ambong districts. He retained the position until 1879, when he became secretary of the American legation at Bangkok. He returned to the United States in 1883.

TORREYA (Neo-Lat., named in honor of John *Torrey*). A small genus of the order Coniferæ, somewhat resembling the yews. They are found in North America and Eastern Asia. *Torreya taxifolia*, a Florida species, reaches the height of 50 feet and has a close-grained and strongly scented wood. The name Tumion has been adopted for this genus by some botanists on account of the name Torreya having been used for another plant.

TORREY BOTANICAL CLUB, The. A scientific society in New York City, incorporated in 1871, and now one of the six associated societies forming the Scientific Alliance (q.v.). It has a valuable herbarium of several thousand specimens, illustrating the flora within one hundred miles of New York, exhibited at the Museum of the New York Botanical Garden, which is the home of the club. The membership in 1903 was 342, of whom 196 were active members. The club publishes the *Bulletin, Torreya,* and *Memoirs.*

TORRIANI, Maria. See Torelli-Torriani, Maria.

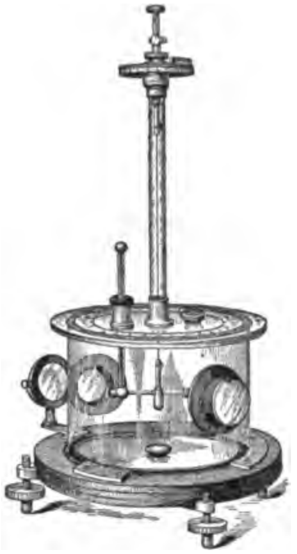
TORRICELLI, tôr'rê-chĕl'lê, Evangelista (1608-47). An Italian mathematician and physicist, born at Piancaldoli, or, according to some authorities, at Modigliana, in the Romagna. From about 1628 he studied mathematics in Rome, under Benedetto Castelli (1577-1644), the favorite disciple of Galileo. Galileo's theories on force and motion especially engaged his attention, and led to his publishing a *Trattato del moto* (1641), a meritorious work, but containing few new discoveries of consequence. He was then invited by Galileo to visit him, and aided the old philosopher, now blind, in the preparation of his *Discorsi.* On Galileo's death he was appointed his successor in the chair of philosophy and mathematics at Florence. Torricelli was the first to use a column of mercury in a tube closed at one end to balance the pressure of the atmosphere, and found that a much shorter column could be used than in the case of water, as in Galileo's experiment. This feat, actually performed by his assistant, Viviani, furnished him with the idea of the barometer (q.v.) in which the space above the mercury in the closed tube has since been known as a Torricellian vacuum. Torricelli also effected the quadrature of the cycloid, but in this he was anticipated by Roberval. He was also the first to construct a simple microscope and improved the telescope.

TORRIGIANO, tôr'rê-jä'nô, Pietro (also Torrigiani and Torregiani) (c.1472-1522). An Italian sculptor, born in Florence. He was a fellow student of Michelangelo in the Giardino Mediceo, and was jealous of him because of his superior talent and his intimacy with their patron, Lorenzo de' Medici. The result was a quarrel in which Michelangelo received permanent disfigurement. Torrigiano fled to Rome, where he modeled the stuccoes in the Borgia Tower for Pope Alexander VI. He was taken by Florentine merchants to London, where he worked for King Henry VIII., executing the bronzes for the tomb of Henry VII. in Westminster Abbey. He also made a bronze monument for the Duchess of Richmond, and works in marble and wood. He afterwards did some work in the Cathedral of Seville, and executed figures of Saint Jerome and Saint Leo for the Girolamiti of that city. Imprisoned on a charge of heresy by the Duke of Arcos, for destroying a statue of the Virgin for which he considered himself underpaid, Torrigiano starved to death in confinement.

TOR'RINGTON. A borough in Litchfield County, Conn., 26 miles west of Hartford, on the Naugatuck River, and on the New York, New Haven and Hartford Railroad (Map: Connecticut, C 2). It has a public library with more than 5200 volumes, and a fine municipal building. Torrington is extensively interested in manufacturing, its various industries in the census year 1900 having had an invested capital of $6,544,511, and an output valued at $10,017,121. The leading products are brass articles, hardware, needles, bicycles, novelties, woolen cloth, and machine tools. The government is vested in a warden and burgesses, who hold office for one year. Population, in 1890, 4283; in 1900, 8360. Torrington was settled in 1737, and was incorporated in 1740 as a town, and in 1887 as a borough. Consult Orcutt, *History of Torrington* (Albany, 1878).

TORRINGTON, Frederick Herbert (1837—). An English musician, born at Dudley, Worcestershire. In 1853 he became organist at Saint Anne's, Bewdley, and in 1856 organist at Great Saint James's Church in Montreal, Canada. He was organist and musical director at King's Chapel, Boston, until 1873; afterwards he became organist and choirmaster at the Metropolitan Church at Toronto, Canada, and conducted the Philharmonic Society there. He founded in 1886 the first Toronto musical festival, and, in 1888, instituted the Toronto College of Music. Among his works are organ-music, choruses, hymn-tunes, and services.

TORSION BALANCE. An instrument originally designed by the Rev. John Mitchell and after his death improved by Henry Cavendish, who used it in performing the well-known Cavendish experiment of determining the mass of the earth. The apparatus was reinvented by Coulomb, and is often known by his name, having been used by him to study electrical and magnetic attractions. It consists of a horizontal rod suspended by a fine wire or in the most recent experiments a fibre of quartz, and carrying at either end two small spheres having a mass equivalent to one gram. Adjacent to but on opposite sides of these small masses are two large spheres of lead which attract the two smaller masses and cause the horizontal rod to deflect, the movement being observed by a mirror and telescope and scale as in the case of the reflecting galvanometer. The force of attraction between two different masses can thus be ascertained, and as the attraction of the earth for a unit mass as well as its radius is known, we can thus determine the mass of the earth. In electricity, charged conductors were substituted for the masses, and to study the strength and action of magnetic poles a long thin magnet was suspended and a similar magnet placed in a vertical position near one of its poles. The amount of force exerted was ascertained by finding the angle through which it was necessary to turn the head carrying the wire in order to keep the suspended bar at its original position. The Cavendish experiment enables the physicist to compute the mass of the earth and to determine also its mean density, which according to Boys is 5.5268.



TORSION BALANCE.

TORSK (Swed., Dan. *torsk*, dialectic Swed. *trosk*, Icel. *thorskr*, L.G., Ger. *Dorsch*, torsk, codfish, haddock; connected with Russ. *treska*, codfish, Skt. *tars*, to thirst, and ultimately with Eng. *thirst*), or Cusk. A small cod (*Brosmius brosme*) of the European side of the North Atlantic, taken in deep water and regarded as valuable. It is usually about 20 inches long, and is distinguished by its long dorsal fin and yellow color.

TORSO (It., stump, trunk.) An ancient statue of which only the body remains. Of such imperfect relics of classic art, the most famous is the *Torso of the Belvedere* in the Vatican, the work of Apollonios, son of Nestor, an Athenian. It is a masterpiece of the later Greek sculpture (first century B.C.), showing a thorough mastery of the treatment of the nude in all its details, though without the ideality of the best period. It represents a man of gigantic build, seated on a rough rock over which a skin is thrown. It is usually called Hercules, though Sauer prefers to consider it Polyphemus. No successful or convincing restoration has yet been made. The common story that it was discovered in the Campo del Fiore at the beginning of the sixteenth century and placed, by order of Pope Julius II., in the Vatican, is certainly wrong. It is only known that it was formerly in the possession of the Colonna family, and was brought to the Vatican by Pope Clement VII. (1523-34). Consult: Loewy, *Inschriften der griechischen Bildhauer*, No. 343 (Leipzig, 1885); B. Sauer, *Torso von Belvedere* (Giessen, 1894).

TOR'STENSON, Lennart, Count of Ortala (1603-51). A Swedish general, born at Torstena, West Gothland, August 17, 1603. He became a royal page in 1618 and attended Gustavus Adolphus in most of his earlier campaigns. When Gustavus entered Germany in 1630, Torstenson was captain of the body-guard; and the brilliant services he rendered at Breitenfeld, the Lech, and in other battles, were rewarded with rapid promotion. Taken prisoner at the storming of Wallenstein's camp near Nuremberg (September 3, 1632), he was released in February of the following year and served till 1635 in Livonia, returning in that year to duty under Bernhard of Weimar and Banér, the successors of Gustavus. In 1641, on the death of Banér, he was appointed to the command of the Swedish forces in Germany. His military career was marked by brilliancy of conception, fertility of resource, resolute daring, and extraordinary rapidity of execution. He invaded Silesia in May, 1642, routed the Imperialists at Glogau and Schweidnitz, reduced most of Moravia, and being pressed back into Saxony by the Archduke Leopold William and Piccolomini, turned upon his pursuers (November 2, 1642), and signally defeated them on the historic field of Breitenfeld. He then laid Moravia and Austria under contribution. The Emperor, Ferdinand III., despairing of protecting his territories from Torstenson, negotiated with Christian IV. of Denmark to make a diversion by invading Sweden; but Torstenson, with characteristic promptitude, left Moravia in September, 1643, traversed Saxony, burst into Holstein, and in less than six weeks subjugated the Danish mainland. The Imperialists under Gallas followed him to aid their allies, but arrived too late, and were routed and driven into Saxony, and again totally defeated at Jüterbog, in attempting to bar Torstenson's return into Bohemia (1644). The Swedish general won a great victory over Hatzfeld at Jankau (March 6, 1645), and carried his arms to the Danube. The Emperor was compelled to flee from Vienna; the Saxons again joined the Swedes; and the Danes, routed at sea as well as on land, sought peace. In 1646 disease compelled Torstenson to resign the command and retire to Sweden, where he was created a count and appointed to various high offices. He died at Stockholm, April 7, 1651. Consult De Peyster, *Torstenson* (New York, 1886). See Thirty Years' War.

TORT (Fr., wrong). A civil wrong other than a breach of contract, which entitles the injured person to a common-law action for damages. It must be admitted that this is rather a general description than an accurate definition of the important legal term before us. And yet, the present state of English law does not warrant a more specific statement. A breach of contract, without excuse, is undoubtedly wrongful, and entitles the party harmed by such breach to a common-law action for damages. But this wrong is always treated under the head of contract (q.v.), and is never spoken of as a tort. The right to damages for breach of contract flows from the agreement of the parties, while that for a tort is conferred by the law, "independent of any previous consent of the wrongdoer to bear the loss occasioned by his act." Again, a trustee who uses trust property for his own benefit without authority wrongs his *cestui que trust*. As the latter's redress, however, is not to be obtained in a common-law action, but by a proceeding in equity, the term 'tort' is not applied to it. The same is true of an inexcusable refusal to pay salvage as redress, for it is to be sought in admiralty and not at common law. These limitations upon the term, it will be observed, are the results of what may be called accidents of legal procedure.

A tort is, as said above, a 'civil' wrong. This element distinguishes it from a crime. It is true that the same act or omission may subject the wrongdoer to a tort action and also to a criminal prosecution. One person deliberately, and without excuse, attacks and wounds another. This assault and battery is a tort, as it gives to the injured person a common-law action in damages, for the invasion of his right of personal security. It is also a crime, as it violates a right of the State by a breach of the peace and by harming one of its citizens.

This branch of our law was one of the latest to receive systematic treatment, either by judges or by text writers. Frederick Pollock declared, in 1886, that the really scientific treatment of this topic by judges begins with the decisions of the last fifty years. In 1882 the New York Court of Appeals asserted that an accurate and perfect definition of a tort was nowhere to be found; nor did it essay to formulate one. The earliest treatise in which an attempt was made to systematize the law of torts was published in 1859.

Various classifications of torts have been suggested. One of them is as follows: "First, lawful acts done by wrongful means or of malice. Second, unlawful acts. Third, events caused by negligence." The first includes deceit, slander of title, malicious prosecution, and malicious interference with contracts between others. The second class includes assault and battery, conversion, defamation, false imprisonment, nuisance, trespass, and some other forms of tort. The third embraces the various phases of negligence. (See these various topics in this Encyclopædia.) A similar classification was suggested by a learned judge in a recent decision of the House of Lords, and has received some judicial approval in the United States. It follows the ordinary classification of personal rights. The first class of torts, according to his suggestion, includes all wrongful invasions of the right of reputation. The second class includes such invasions of the rights of bodily safety and freedom. The third class includes such invasions of the rights of property.

The domain of tort in our law is more extensive than that covered by actions *ex delicto* in Roman law. Speaking broadly, a wrongful intent was necessary to such actions. Mere negligence might subject one to an action *quasi ex contractu* if by agreement he had assumed a duty of care; but otherwise it subjected him to no liability. Certain wrongs were styled *quasi ex delicto*, but as a rule the actionable character of these was of prætorian origin. In

Louisiana, whose jurisprudence rests upon a basis of Roman law, civil wrongs are divided into 'offenses,' or illegal acts which are done wickedly and with intent to injure, and 'quasi-offenses,' or those which cause injury to another but proceed from error, neglect, or imprudence. The term 'quasi-tort' has made its appearance in judicial decisions and recent legal treatises, both in England and the United States. It is not used as synonymous with the 'quasi offense' of Louisiana, nor with the 'quasi-delict' of Roman and Scotch law. It designates an act or omission, which subjects the wrongdoer to a contract or to a tort action, at the injured party's option; such, for example, as a merely negligent injury by a common carrier to a passenger. Consult: Hilliard, *The Law of Torts* (Boston, 1859); Addison, *A Treatise on the Law of Torts* (London, 1860; Albany, 1876); Bishop, *Commentaries on the Non-Contract Law* (Chicago, 1889); Cooley, *The Law of Torts* (Chicago, 1895); Jaggard, *The Law of Torts* (Saint Paul, 1895); Clerk and Lindsell, *The Law of Torts* (2d ed., London, 1896); Pollock, *The Law of Torts* (London and New York, 1901); Sohm, *The Institutes of the Roman Law* (Oxford, 1892).

TORTOISE, tôr'tus (OF. *tortue*, *tortugue*, Fr. *tortue*, tortoise, from Lat. *tortus*, twisted, so called on account of its crooked feet; probably influenced its termination by Eng. *porpoise*). A turtle of terrestrial habits. The term is rather indefinite, but usually distinguishes land chelonians from marine species, although tortoise-shell is exclusively a marine product, and certain fresh-water turtles, as the terrapins, are commonly spoken of as marsh-tortoises. Its most exact application is probably to the family Testudinidæ, in which the shell is always covered with well-developed horny shields. It includes the terrapins or aquatic 'mud turtles' of the genera Emys, Chrysemys, and similar groups, in which the feet are adapted for both walking and swimming, and the carapace is often ornamented by gay colors or sculpturings. Many are almost wholly terrestrial, as is the case with the common box-tortoise (see TURTLE) of the United States. Near allies are the famous Greek tortoise of the Mediterranean region and many other species of the typical genus Testudo; also the Florida 'gopher' (q.v.).

The most important and distinctive members of the group are the gigantic land-tortoises of various oceanic islands, now extinct or nearly so. (See EXTINCT ANIMALS.) All these belong to the genus Testudo and differ little except in size from the other members of the family. Some of them are not larger than other large turtles, but those most noted greatly exceed any other living forms, although surpassed by the *Testudo atlas* of the early Pliocene in India, whose shell was six feet or more in length. Others, with shells about four feet in length, were its contemporaries in Europe and in North America. Their representatives survived until a recent date or still live in the Galápagos Islands, Madagascar, and the Mascarene Islands, but nowhere upon any continent.

Specimens of small species have been known to live more than 100 years, and one, at least, more than 150 years. The Madagascar species (*Testudo Grandidieri*) became extinct probably before that island was discovered by white men, but at least two species of the Camoros have remained until within historic times. One (the elephant tortoise, *Testudo gigantea*, see LAND TORTOISE) is now extinct in its original home, the North Island of Aldabara, but preserved in the Seychelles, and a specimen living in England in 1897 then measured 52¼ × 50 inches over the curve of its shell, and weighed 358 pounds; another in Saint Helena was more than a century old in 1900. Daudin's tortoise, of South Aldabara, also survives in small numbers, and several were taken to Europe in 1895, one of which at least 100 years old had a shell 55 inches long. Still larger is a representative alive in Mauritius, whose recorded history goes back to 1766, when it had already reached large size; it is of a species (*Sumeirei*) native to the Seychelles, to which also belonged the tortoise which lived at Colombo from 1797 to 1898. Several other species, probably or surely extinct, inhabited Rodriguez and other islands of the Indian Ocean, where they were found in abundance by the early voyagers and planters, but were slaughtered for food or as curiosities.

The Galápagos Islands had several species of similar gigantic tortoises, one to each island of the archipelago, which differed from the Eastern ones mainly in having longer necks and smaller heads. Some were long ago exterminated by man or by the pigs which Ecuadorans turned loose upon the islands a century ago; others still survive in small numbers, although in 1893 and again in 1898 large numbers were taken away and distributed to zoölogical gardens in various parts of the world, New York and Washington getting several old and young specimens. The largest collection of all living species is that at Tring Park, England, where the biggest known Galápagos tortoise (*Testudo elephantopus*) is one measuring 56 × 49 inches over the curve of its carapace, which was taken from Duncan Island in 1813 to Rotuma, thence to Sydney in 1880, and finally to England.

Consult: Günther, *Gigantic Land-Tortoises* (London, 1877); Günther, *Proceedings Linnean Society* (Presidential address, 1898—"a fascinating review of the whole complicated subject"); Gadow, *Amphibia and Reptiles* (London, 1901); Darwin, *A Naturalist's Voyage* (London, 1860); *Report United States National Museum* (Washington, 1889). Compare TURTLE; and see illustration under LAND TORTOISE.

TORTOISE-BEETLE, or SHIELD-BEETLE. A leaf-beetle of the subfamily Cassidinæ. The adults are rounded convex beetles with a curious marginal expansion of the upper surface, and with the power of withdrawing the head into the thorax, which gives them a resemblance to a tortoise. Their larvæ are flattened, fringed with spines, and the anal end of the body is provided with a forked appendage which is bent forward over the back; to this are attached the cast-off skins of the larva and its excrement as a protective covering. A remarkable group of tortoise-beetles, belonging to the genus Porphyraspis, cover themselves in the larval state with a dense coat of fibres of the palm tree, upon which they live, each of the fibres being many times the length of the insect's body and elaborately curved so as to form a round nest under which the larva lives. Many species have a brilliant golden green or iridescent metallic coloring which disappears after death, but may be restored by moistening the dead insect. Several very beautiful species occur upon the morning-glory and upon sweet potato (see Sweet-Potato Insects), a large species (*Physonata unipunctata*) feeds upon the wild sunflower, and a very common brick-red species (*Chelymorpha argus*) feeds upon the milkweed.

TORTOISE-SHELL. The semi-transparent and beautifully mottled material of the scales covering the carapace of the hawksbill (q.v.), a marine turtle found in all tropical seas. In this species the thirteen shield-plates do not join at the edges, but overlap posteriorly; the larger central ones are broadly triangular in outline, keeled, and six or seven inches broad, and those of a large turtle may weigh eight pounds. They are rarely thick enough to serve the ornamental purposes to which tortoise-shell is usually applied, but when heated in oil or boiled in water may be welded together under pressure, or molded into a form which will be retained when cooled. "In genuine articles of Oriental manufacture these welds can generally be detected, or their compound nature is indicated by the beautiful pattern, which is too regular in the imitations now common." Even the shavings and fragments are welded into serviceable pieces. The turtles are taken usually when they come ashore to lay their eggs; and the plates are (or were) sometimes removed by roasting the living animal until they were loosened and could be torn off; this was done under the belief that when the mutilated creature was returned to the sea the plates would regrow, but there is no evidence that this occurs, and the turtle probably dies. This cruel process, moreover, injures the tortoise-shell. The best and proper way is to kill the turtle and then detach the plates by immersion in boiling water. In its nature and chemical composition the material closely resembles horn (q.v.). The use of tortoise-shell has long been known. Julius Cæsar found great quantities of it in the storehouses of Alexandria. The Romans veneered furniture with it. In modern times, in addition to comb-making, tortoise-shell is made into card-cases, trays, handkerchief-boxes, and various other articles of ornament and the toilet. It is also used still to inlay expensive furniture, the Chinese and Japanese producing the most complicated and beautiful examples of this sort of art.

TORTOISE-SHELL BUTTERFLY. Any one of the butterflies of the Fabrician genus Vanessa. They are usually of medium size, and have the wings on the upper side of some shade of black or brown marked with red, yellow, or orange. The commonest species in the Eastern United States are the following: *Vanessa antiopa*, sometimes called the mourning-cloak (q.v.), and in England known as the Camberwell beauty. *Vanessa Milberti* is common in the Northern United States and Canada. Its caterpillars feed upon the nettle plants of the genus Urtica. *Vanessa Californica* is confined to California, and in the larval stage feeds upon Ceanothus. *Vanessa j-album*, the 'common tortoise,' is a northern species whose larvæ feed upon willows.

TORTO'LA. One of the Virgin Islands (q.v.).

TORTONA, tôr-tō'nȧ. A town in the Province of Alessandria, Italy, on the Scrivia, 12 miles east of Alessandria (Map: Italy, C 3). It has a ruined castle overlooking the town. The town manufactures silk, markets grain and wine, and quarries stone. Tortona was destroyed by Frederick Barbarossa in the twelfth century for its allegiance to the Guelphic cause. Population (commune), in 1901, 17,452.

TORTOSA, tôr-tō'sȧ. A fortified town of Spain, Province of Tarragona, 42 miles from the city of Tarragona, picturesquely situated on a sloping eminence overlooking the Ebro, from the mouth of which it is distant about 22 miles, and which is navigable to this town for vessels of light draught (Map: Spain, F 2). The town has a cathedral with fine carved work and marbles. There are manufactures of rope, paper, leather, soap, and pottery, of palm-leaf and feather-grass, but the fisheries give employment to most of the people. In the vicinity are ruins of a Roman city. Tortosa is subject to frequent disastrous floods, which have necessitated an almost entire rebuilding of the city. Population, in 1900, 24,306.

TORTRICIDÆ. See Leaf-Roller.

TORTUGA, tôr-to͞o'gȧ, or **TORTUE,** tôr-tụ'. An uninhabited island off the northern coast of Haiti, West Indies (Map: Antilles, L 4). Area, about 80 square miles. Its surface is broken. It was formerly occupied by buccaneers, and produced sugar, tobacco, etc.

TORTUGAS, tôr-to͞o'gaz. A group of islands off the coast of Florida. See Dry Tortugas.

TORTURE (Lat. *tortura*, a twisting, torture, from *torquere*, to rack, twist, torment). The infliction of severe bodily pain either as punishment or for purpose of revenge or for the purpose of compelling the person tortured to give evidence or make confessions in judicial proceedings. Among primitive and savage peoples torture has been used as a means of ordeal (q.v.), and as a means of punishing captured enemies. During the Middle Ages the Church made use of torture as a means of compelling religious conformity and for the purpose of extorting evidence in heresy trials. Throughout Southern and Western Europe the most extreme cruelties were practiced for this purpose (see Inquisition), and it was not until 1816 that torture was finally prohibited by Papal bull. Examination by torture, otherwise called 'the question,' has been largely used in many countries as a judicial instrument for extracting evidence from unwilling witnesses, or confessions from accused persons. In ancient Athens slaves were always examined by torture, and their evidence seems on this account to have been deemed more valuable than that of freemen. No free Athenian could be examined by torture, but torture seems occasionally to have been used in executing criminals. Under the Roman Republic only slaves could be legally tortured, and, as a general rule, they could not be tortured to establish their master's guilt. Under the Empire, however, torture, besides being much used in examining slaves, might by order of the Emperor be inflicted even on freemen, to extract evidence of the crime of *læsa majestas*, a prerogative frequently exercised by the Roman emperors. Cicero and other enlightened Romans condemned its use. Until the thirteenth century torture seems to have been unknown to the canon law; about that period the Roman treason law began to be adapted to heresy as *crimen læsæ majestatis Divinæ*. A decree of Pope Innocent IV. in 1282, calling on civil magistrates to put persons accused of heresy to the torture, to elicit confessions against themselves and others, was probably the earliest instance of ecclesiastical sanction being extended to this mode of examination. Gradually the ecclesiastical courts developed from the Roman law and applied a system of torture which reached its culmination in the atrocities of the Inquisition. The influence of the Church during the Middle Ages undoubtedly contributed to the adoption of torture by the civil tribunals. It was early adopted by the Italian municipalities, but its introduction into Western Europe as an instrument of judicial inquisition as distinguished from the ordeal or compurgation was slow. It first appeared in France in the latter part of the thirteenth century and in Germany in the fifteenth century, and ultimately became a part of the legal system of every European nation except Sweden and England. The use of torture seems to have been repugnant to the genius of the law of England, and it never became a part of the common law, although its use by exercise of the royal prerogative was lawful both in State trials and in the case of ordinary crimes. The first instance we have of its use is in 1310, in aid of the ecclesiastical law, during the struggle between Pope Clement V. and the Templars. Edward II., when applied to to sanction the infliction of torture by the Inquisitors in the case of certain Templars accused of heresy and apostasy, at first refused; but on a remonstrance by Clement, he referred the matter to the council; and on the recommendation of the council, the Inquisitors were authorized to put the accused to the torture, but without mutilation or serious injury to the person, or effusion of the blood. During the Tudor period the council frequently assumed the power of directing torture-warrants to the lieutenant of the Tower, and other officers both against State prisoners and those accused of other serious crimes; and similar warrants were at times issued under the sign manual. Under James I. and Charles I. torture was less resorted to, and only in State trials. In 1628, in the case of Felton, the assassin of the Duke of Buckingham, the judges declared the examination of the accused by torture, for the purpose of discovering his accomplices, to be illegal. The last recorded instance of the use of torture in England was in the reign of Charles I. (1640) to compel a confession of treason. The use of torture was never legal in the English colonies, and the few instances of torture in the American colonies were properly forms of execution, or the infliction of *peine forte et dure* as a means of compelling the defendant to plead to an indictment.

Even during the period when the use of torture was most prevalent its cruelty was recognized and its employment deplored as an evil necessary to the due administration of justice. In all ages there have been leading writers and thinkers who denounced the use of torture, not only because of its cruelty and its debasing effect upon public morals, but because of its unreliability as a means of discovering the truth, since it oftentimes led the innocent from weakness and exhaustion to plead guilty or accuse others of crimes which had not been committed. The horrors of the Inquisition and the excessive use of judicial torture from the fourteenth to the sixteenth century led to a gradual but nevertheless progressive change of public sentiment, which ultimately caused its disuse in all the countries of Europe. The use of torture was abolished in Prussia, Saxony, Austria, and Switzerland by the middle of the eighteenth century. Its use in Russia was limited by command of Catharine II. in 1762, and finally abolished in 1801. In France it was abolished in 1789 (although temporarily restored by the Bourbons in 1814), in Württemberg in 1806, in Bavaria in 1807, in Hanover in 1822, and in Baden in 1831.

The instruments and methods of judicial torture have been numerous. Among the Greeks torture was inflicted by the rack, the scourge, by thrusting the victim bent double into a vault which compelled him to retain that position until his suffering became extreme, the injection of vinegar into the nostrils, and torture by application of fire. The Romans also made use of the rack, torture by fire, the scourge, and mutilating the flesh by hooks. The most celebrated instrument of torture is the rack, an oblong horizontal frame, on which the accused was stretched, while cords, attached to his legs and arms, were gradually strained by a lever or windlass, an operation which, when carried to extreme severity, dislocated the joints of the wrists and ankles. It is as old as the second century in the south of Europe, and seems to have been known in one form to the Greeks, but is said to have been unknown in England till introduced into the Tower by the Duke of Exeter, constable of the Tower, whence it acquired the name of the 'Duke of Exeter's daughter.' In Germany the rack was sometimes furnished with a roller, armed with spikes, rounded off, over which the sufferer was drawn backward and forward. The wheel, upon which the victim was bound and his bones broken by the gradual application of force, was also used throughout the Middle Ages. Among the lesser tortures may be mentioned the thumbikins, boots, pincers, and manacles; and in England an instrument called the Scavenger's (properly Skeffington's) daughter, the invention of Sir William Skeffington, lieutenant of the Tower in the reign of Henry VIII. This enumeration, however, by no means includes all the methods, ingenious and unspeakably cruel, by which torture was inflicted upon innumerable victims during the Middle Ages. Consult: Jardine, *Reading on the Use of Torture in the Criminal Law of England* (London, 1837); Lea, *Superstition and Force* (Philadelphia, 1866); and Stephen, *History of the Criminal Law of England* (London, 1883).

TORUS (Lat., protuberance, mattress, bed). A bold and simple architectural molding, of convex outline, used in doorways and cornices, but especially in the bases of columns immediately above the plinth.

TORY (from Ir. *toridhe*, *tornidhe*, *tornighe*, pursuer, plunderer, from *torighim*, to fancy, pursue). The name of one of the historic parties in England. It was originally the term applied to Irish brigands and about the year 1680 was given as a nickname to the supporters of the Duke of York, afterwards James II., when his exclusion from the succession on account of his (Catholic) religion was proposed by Shaftesbury. It was intended to imply that those who opposed the exclusion were 'Papists.' About 1830 the name 'Conservative' began to take the place of Tory. In the United States during the Revolution the adherents of the Crown were called Tories. See Whig and Tory.

TORZHOK, tôr-zhôk′. A district town in the Government of Tver, Russia, situated on the Tvertza, 294 miles southeast of Saint Petersburg (Map: Russia, E 3). In its vicinity lace, and gold, and silver embroideries are extensively produced by peasant women. Torzhok was a dependency of Novgorod in the tenth century. Population, in 1897, 12,800.

TOSCHI, tô′ckê, Paolo (1788-1854). An Italian engraver, one of the last representatives of the old school of line work. He was born at Parma, went to Paris in 1808 to study engraving under Bervic, with whom he remained until 1819, when he returned to Parma and founded with his friend Antonio Isac a school of engraving. In 1820 he was appointed by Maria Louisa, Duchess of Parma, ex-Empress of France, director of the Academy of Fine Arts, which he was the means of greatly improving and enlarging. His best known works are from Gérard's "Entrance of Henry IV. into Paris" (1818); Daniele da Volterra's "Descent from the Cross;" Raphael's "Spasimo" (Madrid); Correggio's "Madonna della Scodella," and a series of that master's Parmesan frescoes.

TOSTI, tô′stê, Francesco Paolo (1846—). An Italian-English song-composer, born in Ortona di Mare, in the Abruzzi. After studying at the Naples Conservatory, he was appointed an instructor there. He resigned in 1869, went to Rome and appeared in concerts as a singer, after which he was made vocal instructor at the Court, Rome. In 1875 he went to London, and in 1880 was appointed singing teacher to the royal family. His works are: *The Grand Duke* (opera, 1888); *La prima donna* (opera, 1889); and numerous Italian and English songs and duets, which have become very popular. Perhaps his best-known songs are "For Ever and For Ever," and "Good-Bye."

TOS′TIG (died 1066). A powerful English earl, brother of King Harold II. He was probably the third son of Earl Godwin, and shared in his father's banishment, returning with him in 1052. Edward the Confessor was very fond of Tostig, and when Earl Siward died in 1055, Tostig received Northumbria, Northamptonshire, and Huntingdonshire. Tostig proved an able and energetic ruler, restoring security to the disordered country. But his tyranny alienated the Northumbrians, and in 1065 they declared Tostig an outlaw and chose Morcar in his place. Harold sided with the rebels against his brother, and as a result Tostig was banished, though Edward regretted it exceedingly. In 1066, when Harold had succeeded Edward the Confessor as King of England, Tostig offered his support to William of Normandy. This offer was accepted and Tostig thereupon went to King Harald Haardraade of Norway, and induced him to make an invasion into England. But on September 25, 1066, King Harold met them at Stamford Bridge and totally defeated them. Harald Haardraade and Tostig were both slain. Consult Freeman, *History of the Norman Conquest*, vols. ii. and iii. (3d ed., Oxford, 1877). See Harold II.

TOTAL ABSTINENCE. See Temperance.

TOTANA, tô-tä′nȧ. A town of the Province of Murcia, Spain, 24 miles southwest of the town of that name, on the left bank of the Sangonera (Map: Spain, E 4). A gorge divides the town into two parts, the *Barrio de Sevilla* and the *Barrio de Triana*. The town is celebrated for its oranges, the mining of saltpetre, linen-spinning, and especially for its *tinajas* (terra-cotta jars), widely used for holding oil and wine. Water is brought to the fountains by an aqueduct seven miles long. The town is connected by a canal with the seacoast at Mazarrón. Population, in 1900, 13,714.

TOTEMISM (from *totem*, from Algonquin *nt' otem*, my family token). The worship of a totem. Primarily a totem is a natural object employed by the American Indians to designate a certain relationship between groups of human and non-human individuals. The relationship is always peculiarly close, but not always of the same sort. The only general characteristic of all forms of totemism is the belief in a closer connection between certain groups of men and certain groups of non-human objects than naturally exists between all men and all non-human objects. Thus totemism is distinguished from fetishism (q.v.), though the latter has frequently been confounded with it. In true totemism the object of human regard is not an individual object, as it is in fetishism, but is the group of objects with which certain men (and women) as a group feel themselves to be related by a peculiarly close tie. Thus if a clan call the sun their brother, they are not totemists in the strict sense of the word. On the other hand, the Hindu who calls the monkey his brother is also not a totemist, although the monkey represents (as the sun does not) a group, for in this case the same Hindu calls other animals his brothers as well.

In totem-brotherhood, however, there is an important outer symbol, the name. Thus, when a savage names himself after an animal species, calls the individual animal of that species his brother, and refuses to kill it, the animal (species) is his totem, which is generally tribal and hereditary. The reason why a tribe revere a particular species of animal or plant is, according to Frazer, that the life of each individual of the tribe is bound up with some one animal or plant of the species, and that his or her death would be the consequence of destroying that particular animal or plant. Hence Frazer defines the totem as the receptacle of the life of the totemist, "in which the individual deposits his soul." The same mysticism pervades the elaborate theories of other scholars who regard the connection with the totem as a blood-relationship between men and animals (imagined to be the ancestors and brothers of men), and the first totemic sacrifices as a renewal of the blood-bond between the divine animal ancestor and his human descendants. According to this theory, the altar was at first the bethel or home of the divine animal ancestor, on which blood was shed to renew the bond and so strengthen the human group of worshipers.

But while this theory explains certain forms of totemism, it fails to explain all, and here it must be admitted that the word totemism is not used either by Frazer or by others as if it stood for a well-defined conception. For a clan may have at the same time various totems; the totem, again, is not constant, but may be exchanged for another; the sexes in the same clan are credited with possessing different totems; any one family in a clan may have its special totem; any individual may have a private totem besides his clan totem; a totem may be no one group of objects, but be the odds and ends of any animal or vegetable group; the tribal totem may be divided, and each clan have as its totem a part; or, instead of a divided totem, there may be, besides the tribal totem, a number of 'honorific' totems; and finally, totems may be natural phenomena, clouds, lightning, thunder, or even colors. These different sorts of totems are of course not found together. The 'honorific' totem, for example, is characteristic of some Indians of the Northwest; the totem of odds and ends, such as the tails of animals and pieces of string, is found in Samoa; the cloud and lightning totems, in Australia; and the color-totem, blue or red, among certain Indian tribes of the Middle West.

Though these varieties seem to lack all coherence, there has been claimed for totemism this common bond, that in all its varieties it at least conditions the matters of bed and board. That a totemist must marry outside of his totem group and must not eat of his totem (if, as in most cases, this is an animal or a vegetable) are the foundation stones of certain theories of totemism. But totemism can no longer be said to bear this implication, for neither has the eating of the totem nor exogamy anything to do with the most primitive forms of totemism.

The most striking fact in the totemism of the Australian, which is most primitive in type, is that it has nothing to do with regulating marriage, nor has the child necessarily either its mother's or its father's totem. Therefore, the totem is not a mark of blood-kinship. According to Australian belief, all the spirits live in certain restricted localities, and a man's totem is determined by the locality in which the spirit enters his mother's body, conception being thus explained. Further, far from exogamy being the result of totemism, exogamy is by no means a totemic law. There is in some tribes no restriction on marriage within the tribal group, and in fact endogamy, or marriage within the tribal group, appears to have been the first rule.

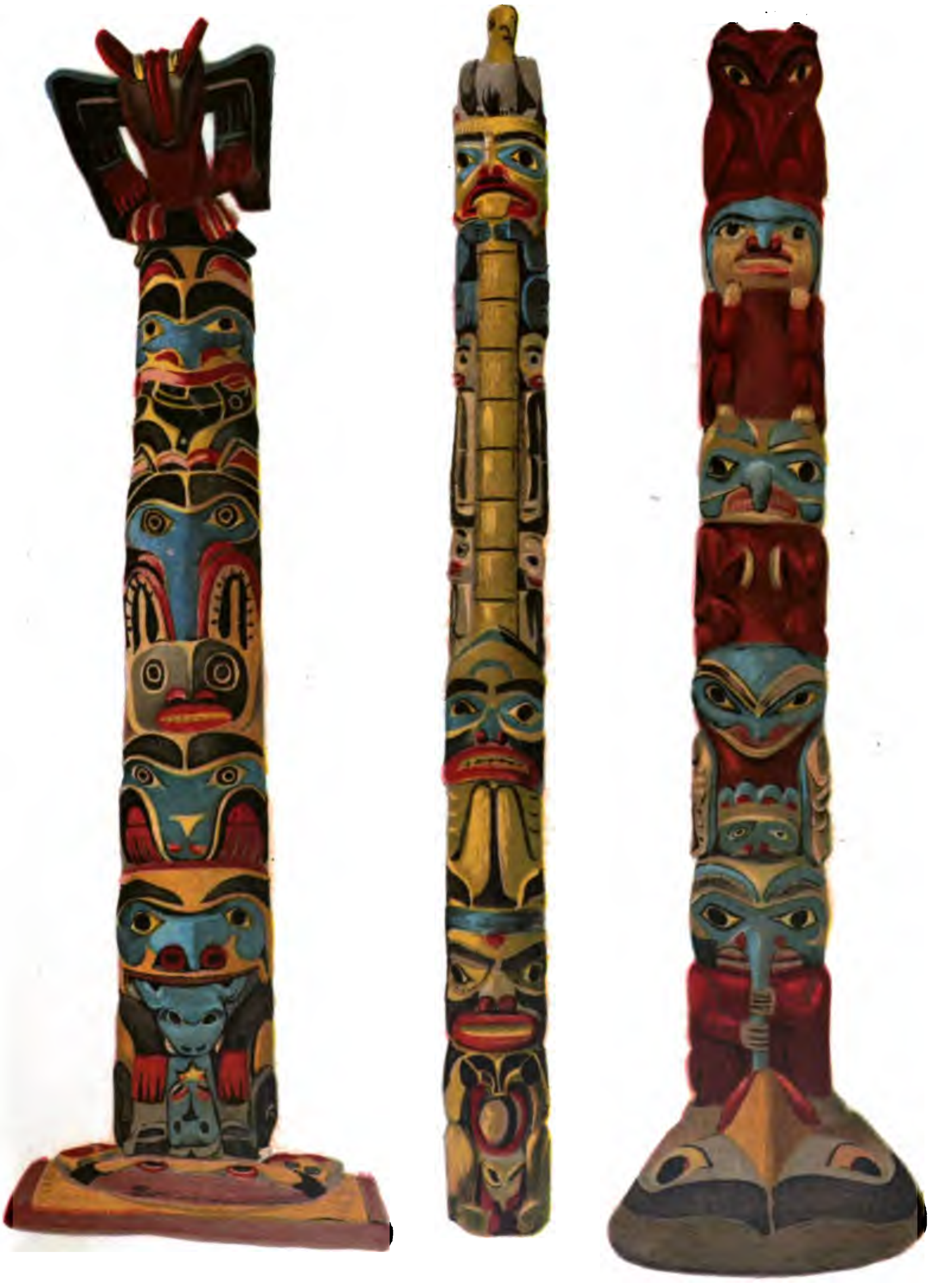
Not less important are the facts in regard to the relation between the totemist and his food. Here, as in many other cases, it is clear that the animal or plant first venerated by a savage is the food that preserves his life. The redskin does not eat maize because he regards it as his sacred ancestor, but it is sacred and his parent because he is dependent upon it for sustenance. Among the Australians it is the totem animal which was eaten by predilection in the original form of the institution. Just as utility deified the Hindu's cow and the Indian's maize, so the opossum was sanctified by the Australian who lived upon it, and as such it became his totem. For this reason the Australians have certain totem rites, the object of which was simply to increase the food supply. But, on the other hand, as the Waganda tribe in Africa spared certain animals because they were indigestible, so in Australia the men of the wildcat totem might eat wildcat on a certain occasion when it was strictly prohibited to those of that totem with whom it was likely to disagree, such as the aged. In this instance the Australian eats his totem as far as health permits. The totem may be killed by those not belonging to the totem group, and the latter will even aid the alien to kill their own totem.

In the course of time, however, the sacredness of the totem, as among the majority of the redskins, becomes such as to prevent general slaughter of the totem animal. Thus we find that, whereas the Australians of ancient days (as reported by tradition) might eat freely of the totem animal (or plant), the modern descendants of those primitive Australian totemists dare not do this so freely. But even to-day the totem animal is not considered a kinsman whom it would be wrong to kill; the connection is rather spiritual, as indicated by the circumstance that it is among those tribes that we find rain and sun regarded as 'totems.' The explanation is in accordance with the notion of conception as given above. The spirit of the man belongs to the same locality as the spirit of the rain or of the sun. The sun supply and the rain supply are aided by the same sort of rites as those instituted to increase the food supply. There is no question of blood-kinship, but of a brotherhood based largely on a locally limited interchange of spirits, a restricted metempsychosis. The blood of a kangaroo man (one who belongs in the kangaroo totem) is not shed as a symbol of kinship and communion, but for the avowed purpose of frightening away other kangaroo spirits, that they may escape in their terror into female kangaroos and so increase the food supply. The whole system is at bottom economic rather than religious.

The historical explanation, as opposed to the theoretical mystical explanation of a primitive blood-communion with gods, shows that blood-communion and sacrifice of the totem are far from primitive traits, and offers an orderly and natural sequence in the totemist's evolution. Nor is there anything improbable in the totemist's changed attitude toward the totem at different points in the historical series. In the first place, we find actually existent these two phases, one of food supply, the other of the sacred inviolable totem, in the development of the Australians themselves. For had the latter phase been original, it is impossible that any legends could have arisen to reflect a phase in which a totem was the chief food of the community; and yet all the tribal legends represent the totem in this way. Moreover, the connecting link in the series is fortunately preserved in the well-known account of Agatharchides concerning the troglodytes of East Africa, who two thousand years ago pastured their herds there and lived upon them, drinking their milk and blood and occasionally eating the flesh of the cattle, but not very willingly, because "they regarded the cattle as their parents, inasmuch as they got their sustenance from them."

The institution of totemism, however, is not homogeneous, and different causes may have resulted at different times in totemism of different sorts which have a general similarity. Indigestion, as among the Waganda, may have resulted

TOTEM POLES, SOUTHERN ALASKA



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO. LITH N Y

in one clan refusing to eat one group of animals; while the American Indian, who takes as his private totem the animal seen in a dream the night before he is initiated into the tribe, may often have converted his own totem into that of his tribe. Honorific totems are merely assumed for politeness, so to speak. They are at least always of secondary origin. Color totems and odds and ends as totems are little more than fetishes and may be explained accordingly. Sex totems are not true totems at all, but deserve a specific name. Certainly in such cases there is neither blood-kinship nor any trait of real totemism. Nor is it a proof of totemism when a race holds the belief that its ancestors were divine and includes among its many ancestral gods divine animals, any more than it is totemic to derive a race from a tree. The Algonquin Indians, for example, like the ancient Scandinavians, hold that all men are descended from an ash-tree; yet this tree is not their totem. It must be remembered also that when an institution is once established it moves forward of itself. Hence there may be clans which take to themselves totems unsuitable as food merely because other clans in their environment have totems, which are no longer interpreted as providers of food, but only as tutelary objects. In some cases totems may be assumed as coats of arms are assumed, simply to be in the fashion. Thus a tribe in Bengal a few years ago assumed as a tutelary divinity the dog, and the dog is to-day practically their totem. The reason why they chose any such divinity was simply that all their neighbors had totems and they wished to be fashionable, while the reason they selected the dog was that 'it was useless when dead' (i.e. it could not be eaten, and so might as well serve as a totem). Then, too, there are cases where what seems to be a genuine totem shows itself on inspection not to be of the same class with cases of genuine totemism. Thus an African selects before death the animal he will become after death, and this (species) then becomes sacred to his descendants.

Frazer divides totemism into what he calls the Egyptian kind and the Aino kind. Among the ancient Egyptians it was the custom, as it is to-day the custom among the Todas of India, to slay certain animals only as a sacrament; while among the Caucasian tribes and the Ainos of Japan it is customary to kill as a sacrament certain animals which are also killed regularly. But these two kinds are only stages of totemism. The sacramental slaying of an animal regularly killed is an expiation, based upon the same principle as that which induces a savage to apologize to a bear before killing it, but all sacrifice of totems is non-primitive.

The theory has recently been advanced that totemism was at first a kind of writing, indicating a clan; that those men called e.g. Beavers came to believe they were 'beaver sons;' and that worship of the beaver totem arose from this belief. In the most primitive totemism, however, the only support given to this version is that the totem is tattooed on the body of a clansman, which, obviously, might be due to a prior respect for the totem.

In conclusion, certain aspects of totemism may be mentioned because they have been more or less utilized in creating doubtful history. Thus totem-poles have been cited as originating all idol-worship, and the practices of decorative mutilation and tattooing have been referred to totemism though they are found where no totemism exists. More important is the fact that the sacrifice of the totem, whether piacular or not, appears to be of secondary origin; for this does away with the further claim that ceremonies in relation to the birth and death of vegetation (such as the spring and harvest festivals of India, Babylonia, Germany, etc.) are borrowed from totemism, a contention no longer upheld by the best authorities. A further misunderstanding on the part of some writers is due to a confusion in regard to the relation between taboo and totemism. These in themselves have nothing to do with each other. On the contrary, they are often found in inverse proportion. Thus in Polynesia there is no totemism except in Samoa, while taboo (q.v.) is the chief religious factor in all Polynesia. In a word, totemism often entails taboo, but taboo does not imply totemism.

Totemism is far from universal. It is found among the American Indians, the Australians, certain Africans, the Egyptians, etc., but not only are there tribes even in America which have no totemism, but there are whole races, such as the Eskimo, which show no trace of it, and others, such as the Chinese, which have scarcely any totemism. The races most discussed in this regard are the Semites and Aryans. In proof of the Aryans having been totemists the reverence paid by the Greeks to fishes and storks, the existence of a wolf clan, and the 'murder' of an ox have been cited. The 'wolf' and 'bear,' Greek tribal names, have also been regarded as a proof of totemism. But here, as among the Semites, the connecting links which should prove the existence of the totemic institution are always found to be wanting. Reverence paid to animals is no proof of totemism, and still less proof is furnished by men having animal or vegetable names. The only evidence for the existence of early Vedic totemism is found in such names. The only ancestor man is called Cucumber, and at once the inference is drawn that we have to do with the Cucumber clan of totemists. But in New Zealand, where totemism is unknown, a chief was also called Cucumber, and the reason is expressly "because he crept so rapidly and so stealthily" (around his enemies). The vital point in all such cases is whether families of men are regarded as related to families of vegetables or animals. Among the Aryan Hindus, the Teutons, and the Romans, or even among the Greeks, there is not the slightest proof of any such belief. It has been shown, indeed, that the Semites believed in kinship between men and gods, and the proof of a belief in kinship between gods and animals has been thought possible; but in respect of the most important third proof, kinship between groups of men and groups of beasts, no satisfactory evidence has been offered.

Consult: Tylor, *Early History of Mankind* (London, 1870); Lubbock, *Origin of Civilization* (ib., 1884); Robertson Smith, *Kinship and Marriage* (ib., 1885); Frazer, *Totemism* (Edinburgh, 1887); id., *The Golden Bough* (2d ed., London, 1900).

TOTE'RO. A North American Indian tribe. See TUTELO.

TÓTH, tŏt, Koloman (1831-81). An Hungarian poet, born at Baja, County of Bács-Bodrog. He took part in the Revolution of 1848, and published in 1852 his first collection of patriotic poems, which achieved instant success. The next year appeared *Paul Kinizsi*. Then came a number of plays, one of which, *Egy királyné* ("A Queen," 1857), took the Academy's prize. In 1860 Tóth founded the comic paper *Bolond Miska* ("Foolish Michael"). The same year he was elected to the Kisfaludy Society, and in 1861 to the Academy. The play *A nök az alkotmányban* ("Women in Constitutional Life," 1871) was the first to be well received on the stage, Tóth's popularity being in the field of patriotic verse.

TOT′ILA. An Ostrogothic king whose real name was Badvila. He was chosen in 541 to occupy the throne made vacant by the assassination of his uncle Hildibald. He prosecuted the war with the forces of the Eastern Emperor not only with great success, but also with chivalrous generosity and humanity. After reducing Southern Italy, he laid siege to Rome, to relieve which Justinian once more sent out the celebrated Belisarius. The city fell, however, in 546, and after five years of fruitless warfare, in which he was poorly supported by his Government, Belisarius asked to be recalled. Totila thereupon ravaged Sicily, reduced Sardinia and Corsica, and harassed the coasts of Greece, but in 552 was defeated and killed at Taginæ (or Tadinæ) by an army under command of the eunuch Narses.

TOTLEBEN, tŏt′lā-ben, or **TODLEBEN**, Franz Eduard Ivanovitch, Count (1818-84). A Russian general of engineers. He was born at Mitau, Courland, May 20, 1818, and after studying at Riga was admitted as a student to the college of engineers at Saint Petersburg. He served as a lieutenant of engineers in the Caucasus campaign of 1848-51, and in 1854 took part in the siege of Silistria. When the French and English troops undertook the siege of Sebastopol, Totleben, then a colonel, was sent to assist in its defense. The fortifications were placed under his direction. The principle on which he acted was to watch the works of the allies, and to establish against them on every point a superiority of fire, by multiplying the number and increasing the calibre of his guns. The prodigious activity displayed by the Russians in making good the damage sustained by the heavy fire of the enemy filled the allied army with astonishment. Massive ramparts mounted with formidable batteries rose at each threatened point within the line of defense. In June, 1855, Totleben was wounded and he was forced to relinquish active supervision of the defense. After the conclusion of peace he expanded what was at first a mere engineer's report into a history of the war in the Crimea, entitled *Défense de Sebastopol*. For his services Totleben was made adjutant to the Emperor, and in 1869 general of engineers. In the Russo-Turkish War of 1877-78 Totleben was intrusted with the investment of Plevna after repeated assaults on the works had been repulsed with immense slaughter. He succeeded in completely cutting off the city from all outside relief, so that finally nothing was left to Osman Pasha but to attempt to break through the lines of the besiegers, in which he failed. In April, 1878, he received the supreme command of the Russian forces in Turkey. He became Governor-General of Odessa in 1879 and commandant of Vilna in the following year. He died at Soden, Germany, July 1, 1884, and was buried in Sebastopol. (See Crimean War.) There are biographies of Totleben by Brialmont (Brussels, 1884) and by Krähmer (Berlin, 1888).

TOTO′NAC. An ancient cultured nation whose territory embraced the northern portion of the present State of Vera Cruz, with the adjacent portion of Puebla, Mexico. Their language has numerous Mayan and Nahuatlan affinities, but appears to be of distinct stock. They claimed to have come from the northwest about eight hundred years before the Spanish Conquest and to have been the builders of the remarkable ruins of Teotihuacan, about ten miles northwest of the City of Mexico. For several centuries they had maintained their independence, but had been conquered by the Aztec emperors some time before the coming of the Spaniards. Cortez made his first landing in their territory. They were fully as highly advanced as the Aztecs. Their capital, Cempoalla, was about five miles from the seacoast, with houses built of brick and mortar, each house in the centre of a small garden watered by a constantly flowing stream, and the city itself was surrounded by fruit trees and fields of grain. Their religion was a ceremonial sun-worship, and they practiced circumcision and head-flattening. They still constitute an important part of the population of their former territory, retaining many of their ancient rites interwoven with those of the conquering religion.

TOTONICAPAN, tŏ′tô-nê-kȧ-pän′. A town in the department of the same name, Guatemala, 61 miles northwest of the capital city (Map: Central America, B 3). Its population is almost wholly native, of Quiché descent, and its industries accordingly consist of simple weaving and wood and stone work. The country is mostly sterile. The town was the centre of the Quiché opposition to Alvarado. Population, about 20,000.

TOT′TEL, Richard (c.1525-94). An English publisher, compiler of the celebrated *Tottel's Miscellany*. Of his early life nothing is known. Granted in 1553 a seven years' patent to print law books, and charter member of the Stationers' Company in 1557, his patent was renewed for life in 1559. He reached a high position in the Stationers' Company, finally dropping out of it in 1589 on account of ill health. Besides the law books which he issued, Tottel published a few volumes of general literature which invest him with a literary and bibliographic interest. Among these were More's *Dialogue of Comfort* (1553); Lydgate's *Fall of Princes* (1554); Hawes's *Pastime of Pleasure* (1555); Grimald's translation of *De Officiis* (1556); and Surrey's translation (1557) of the second and fourth books of the *Æneid*—the earliest English blank verse known. The *Miscellany* appeared June 5, 1557, and contained 271 unpublished poems by Surrey, Wyatt, Grimald, Forrest, Heywood, Thomas, Vaux, and others unidentified. The verse of Surrey and Wyatt is not known to have appeared anywhere else. The book was the first of poetic anthologies in England.

TOT′TEN, Joseph Gilbert (1788-1864). An American soldier, born at New Haven, Conn. He graduated at West Point in 1805; and during the

War of 1812 served as chief engineer in the campaign of 1812-13 on the Niagara frontier and in that of 1813-14 on the Lake Champlain line of operations; and participated in the battle of Queenstown Heights, the capture of Fort George, the attack on La Cole Mill, and the battle of Plattsburg. For gallant conduct in the last-named engagement he was brevetted lieutenant-colonel. In 1847, during the Mexican War, he directed the engineering operations in the siege of Vera Cruz, and for his services was brevetted brigadier-general. During the Civil War he served as commander of the corps of engineers (1861-64); as president of a board to regulate and fix the ordnance of permanent fortifications and field batteries (1861-62); and on April 21, 1864, one day before his death, was brevetted major-general, United States Army, for "long, faithful, and eminent services." He was much interested in the natural sciences, and was an authority on conchology. Two species of shells, the *Gemma Tottenii* and the *Succinea Tottenii*, were named in his honor. He published: *Reports on National Defenses* (1851); *Essays on Ordnance* (1857); and other works.

TOTTENHAM, tŏt'*en*-*a*m. A town in Middlesex, England, a connecting suburb of London, six miles northeast of Saint Paul's (Map: London, C 8), on the river Lea, which affords good bathing and boating. The town is undergoing much modern improvement; owns its water-works; maintains a free library, recreation grounds and parks, including the Bruce Castle Park, the site of the old Bruce estate and castle in which King Robert's father died in 1303. Alexandra Palace, a favorite metropolitan pleasure resort, is partly within the urban limits. Population, in 1891, 71,343; in 1901, 102,519.

TOTTORI, tôt-tō'rê. The capital of the Prefecture of Tottori, in Western Hondo, Japan, 70 miles northwest of Kobé (Map: Japan, D 6). It has manufactures of cotton and silk goods. Population, in 1898, 28,496.

TOUCAN (Brazilian *toucano*, probably nose-bone, less plausibly explained as meaning feather, or of onomatopoetic origin). A bird of the family Rhamphastidæ, related to the barbets, jacamars, and puff-birds (qq.v.), and not very distantly to the woodpeckers, and containing about 50 known species, all natives of tropical America, and remarkable for the magnitude of the bill. They are divided into two groups, the true toucans (Rhamphastos) and the araçaris (Pteroglossus), of which the latter contains the greater number of species; the former has the larger bill, and the tail is shorter. There is a difference also in the prevalent colors, the araçaris generally exhibiting much green and yellow, while the true toucans have the ground color of the plumage usually black; the throat, breast, and rump often gayly adorned with white, yellow, and red. The colors, however, are not in general finely blended, but appear in strong contrast. The legs of toucans are short; the feet have two toes before and two behind. The form of the body is short and thick; the tail is comparatively short, rounded or even, and is turned up over the body when the bird is at roost. The enormous bill is at the base of the full width and depth of the head, and is in some species more than half the length of the body. It is arched toward the tip, irregularly toothed along the margins of the mandibles, and extremely cellular and light, yet strong in structure. The tongue is very long, narrow, and singularly feathered on each side, and takes an important part in gathering food. Toucans eat fruits with avidity, but they also seize and devour small birds, lizards, etc. They make a curious clattering noise with their great mandibles and also emit a harsh cry. They live chiefly in the depths of the South American forests, in small flocks. They lay two white glossy eggs in hollows of trees, making little if any nest for them, are easily tamed, and in captivity readily eat rice, bread, potatoes, eggs, meat, and many other kinds of food, and make amusing pets. The colors of the bill are, in most of the species, very brilliant during life, but disappear from stuffed specimens in museums. The largest species, as the toco of Argentina (*Rhamphastos toco*), are about 24 inches in length, the bill in this species measuring 7½ inches, and the tail 10 inches. One of the most familiar species is the Brazil ariel, in which the throat is yellow and the rump scarlet. See Plate of HORNBILLS AND TOUCANS.

TOUCEY, tou'sĭ, ISAAC (1796-1869). An American politician, born at Newtown, Conn. He was educated privately, studied law, and was admitted to the bar at Hartford in 1818. From 1822 to 1825 he was State's Attorney for Hartford County, and from 1835 to 1839 was a member of the United States House of Representatives. He was again State's Attorney in 1842-44, and was elected Governor by the Legislature in 1846 when the election was thrown into that body. From June, 1848, to March 3, 1849, he was Attorney-General of the United States. In 1850 he served in the State Senate, and in 1852 in the State House of Representatives. In 1852-57 he was United States Senator and under President Buchanan he was Secretary of the Navy. It was charged by the Republicans that he had manifested his sympathy with the Southern cause by sending the warships of the United States to distant stations so that they could not readily be gotten together.

TOUCH (OF. *toucher*, *tocher*, Fr. *toucher*, It. *toccare*, from Germ. **tukkōn*, OHG. *zuckan*, Ger. *zücken*, to twitch; connected with OHG. *ziohan*, Ger. *ziehen*, Goth. *tiuhan*, AS. *tēon*, to draw). One of the five special senses; the tactile sense. The sense of touch is widely distributed, but it must be distinguished from the other varieties of common sensation—pain, and temperature perception. These are perceived through the same nerves—the sensory—but the nerve fibres which are identified with the sense of touch proper are provided with special end organs, and the sense, moreover, is only exercised in any degree of perfection in those parts where there is an abundance of special end organs. These are of two kinds: *touch corpuscles*, situated chiefly in the skin; and *end bulbs*, found mainly in the mucous membranes. The lips and genital organs, being on the border line of skin and mucous membrane, are possessed of both touch corpuscles and end bulbs. The *Pacinian corpuscles* are widely distributed, but their part in connection with the tactile sense is only partially understood. They are numerous as the nerves of the palmar surface of the fingers, but, when found, are situated deeply in the skin or in the subcutaneous tissue. The acuteness of the sense of touch depends to some extent on the cutaneous circulation, and this is largely influenced by the surrounding temperature. The numbness produced by the application of cold to the surface of the body is thus explained.

The acuteness of the sense of touch is commonly measured by an instrument known as the æsthesiometer and consisting of two needle points in arms movable upon a graduated scale. A pair of compasses may be used in the same way. The nearer together the points can be separately perceived the greater the delicacy of touch. The distance at which these two points can be separately distinguished in various parts of the body is indicated in the following table:

Tip of tongue	1.1	m.m.
Palm of terminal joint of finger	2.2	“
Palm of second joint of finger	4.4	“
Tip of nose	6.6	“
White part of lips	8.8	“
Back of second joint of finger	11.1	“
Skin over cheek bone	15.4	“
Back of hand	29.8	“
Forearm	39.6	“
Sternum	44.0	“
Back	66.0	“

It will thus be seen that the point of greatest delicacy of touch is the tip of the tongue, and the seat of the least developed tactile sense is the skin over the spinal column. The sense of touch, like all other perceptions, can be sharpened by exercise. This improvement is not to be explained by an increased development of the terminal organs, nor by a growth of new nerve fibres in the skin, but by a more exact limitation of the sensational areas in the brain. Many artisans acquire a highly specialized sense of touch. The delicacy of the tactile sense in the blind is a well-known condition; these people are able to read fine raised letters, and to make various articles of delicate structure, in a manner impossible to individuals who can see. See Psychology; Sensation; and Skin.

TOUCH. In music, a term denoting the manner in which the digitals of a keyed instrument are manipulated. Most important are the smooth legato touch and the detached staccato touch. It is of vital importance which muscles are employed in playing different passages. The muscles of the fingers, the wrist, and the arm produce very different effects, generally distinguished as tone-color. Thus, when we speak of a pianist as lacking in color, it means that he employs one set of muscles almost to the exclusion of others. It is the matter of touch that produces what are called singing, velvety, or hard tones.

TOUCHSTONE, or Lydian Stone. A hard, black, siliceous stone or flinty jasper used for testing the purity of precious metals, especially gold. The stone originally used was a peculiar bituminous quartz from Lydia, in Asia Minor. When a piece of gold is rubbed across the surface of the stone it leaves a streak which is more or less reddish, according to the amount of copper that it contains, and by comparing the streak with those of alloys of known composition, the expert can determine approximately the value of the metal.

TOUCH-WOOD. The decayed wood of willows and some other trees used as tinder. See Amadou.

TOUCHWOOD, Lady. (1) In Congreve's *Double Dealer,* the wife of Mellefont's uncle. Mellefont does not respond to her advances, and in revenge she accuses him of dishonorable proposals. (2) In Mrs. Cowley's *Belle's Stratagem,* a loving wife guarded by a jealous husband.

TOUL, to͞ol (anciently *Tullum Leucorum*). A fortified town, capital of an arrondissement in the Department of Meurthe-et-Moselle, France, 14 miles west of Nancy (Map: France, M 3). The former Cathedral of Saint Etienne is noted for its graceful proportions, octagonal towers, and thirteenth-century cloisters; the fine Gothic Church of Saint Gengoult also has elegant cloisters, in the flamboyant style of the sixteenth century, and the eighteenth-century episcopal palace is now used as the town hall. The bishopric, founded in the fifth century, was suppressed at the time of Napoleon. In the latter part of the Middle Ages, and later down to 1552, Toul was a free city of the German Empire. In that year it was seized by Henry II. of France. In 1790 its fortifications were reconstructed upon the Vaubanian principle. In 1814 the town was stormed by the Russians, and on September 23, 1870, it was taken by the Germans after a siege of nearly six weeks. Population, in 1901, 12,287.

TOULMIN, to͞ol′mĭn, Henry (1767-1823). An American jurist, born at Taunton, England. He removed in 1793 to Virginia, and from 1794 to 1796 was president of Transylvania University. In 1796-1804 he was Secretary of State of Kentucky, and in the latter year was appointed judge of the United States Circuit Court of Mississippi. Subsequently he served in the Alabama Legislature, and assisted in framing the Constitution of that State. He published *A Description of Kentucky* (1792); a *Collection of the Acts of Kentucky* (1802); a *Digest of the Territorial Laws of Alabama* (1823).

TOULMIN, Joshua (1740-1815). A Unitarian clergyman. He was born in London; became pastor of a dissenting congregation in Colyton, Devonshire, in 1761. In 1765 he accepted a call from a Baptist congregation in Taunton. He then became a Unitarian, and in 1804 became minister of a Unitarian congregation at Birmingham. He published many biographies, including *Memoirs of Faustus Socinus* (1777); also *A Historical View of the State of the Protestant Dissenters in England Under King William* (1814); and edited Neal's *History of the Puritans* (new ed., 5 vols., 1822). A volume of sermons was published after his death (1825).

TOULON, to͞o′lôɴ′. The capital of an arrondissement in the French Department of Var, a fortress of the first class, and the second naval station in France (Map: France, M 8). It is situated on a fine and well-protected bay of the Mediterranean, 42 miles east-southeast of Marseilles, and is partly surrounded by hills, crowned by detached forts. The old town in the southern part of the city is of uninviting appearance. Surrounding it on the north are the modern quarters embellished with wide avenues and fine buildings. In the old town is situated the only ancient building of any particular architectural value—the Sainte Marie-Majeure Church. It is Romanesque and dates from the eleventh century. It contains a handsome reredos. Besides the numerous naval and military open spaces and grounds (including the Place d'Armes) in Toulon, there are, in the northern part, two spacious and prominent squares—the Place de la Liberté (the finest in the new town) and the Jardin de la Ville, an attractive promenade. The most important avenue of the city—the Boulevard Strasbourg—connects the two squares, and on it are the Musée Bibliothèque (a handsome modern Renaissance edifice) and the immense Marine Hospital. The Place d'Armes, to the southeast and near the port, is the main square in the city.

The harbor has five principal basins. It connects with surrounding bays, which stretch away under hills bristling with forts, and extends past Fort de l'Aiguillette out into the great harbor or roadstead which opens into the sea. The port has an easy access and is well sheltered. The marine arsenal, an immense and complete establishment with its buildings, basins, and canals, adjoins the city on the west. It dates from the time of Henry IV., and on an enlarged scale was planned by Vauban. It embraces 650 acres. Over 12,000 men are employed.

Toulon has a lyceum, the Ecole Rouvière, marine schools, a marine library, a marine botanic garden, and a marine observatory. The leading theatre is a splendid modern edifice containing 1800 seats. Shipbuilding, iron and copper founding, lace-making, fishing, and viticulture are the main industries. The vicinity produces olives and figs. The principal exports are wines, oils, and fruits. In 1899 there entered and cleared 755 vessels of 323,415 tons. The population, in 1901, was 101,602.

Toulon is the ancient Telo Martius, noted for its dye-works. It was destroyed by the Saracens in 889, and like calamities befell it in the twelfth century. It surrendered to the forces of Charles V. in 1524, and also in 1536. Henry IV. and Louis XIV. fortified it. It repelled the allied fleets of England and Holland in 1707. In 1793 it was turned over by the Royalists to the English and their allies. It was thereupon besieged by the forces of the Convention, Napoleon Bonaparte gaining there great distinction as commander of the artillery. The town was taken in December and its inhabitants were ruthlessly punished. Consult: Teissier, *Notice sur les archives communales de la ville de Toulon* (Paris, 1863); Lambert, *Histoire de Toulon* (Toulon, 1885-90); Rozet, *Essai sur la climatologie de Toulon* (Paris, 1890).

TOULOUSE, tōō'lōōz'. A city of France, the former capital of Languedoc, and the present capital of the Department of Haute-Garonne. It is situated 130 miles southeast of Bordeaux (Map: France, H 8). Toulouse lies in a rich valley on the right bank of the navigable Garonne. It is subject to high winds, to floods, and to very hot weather in summer. Three bridges across the river connect the city with the Faubourg Saint-Cyprien on the west bank. The noble Pont Neuf, a stone bridge of seven arches, dates from 1543. The streets of Toulouse are for the most part narrow, unattractive, and poorly paved. Two wide lines of boulevards, however—the outer one following the canals—divide the city pleasantly from the surrounding suburbs, and many extensive improvements have latterly been begun. On the extreme east is the Parc du Caousou.

In the centre of the town, in the Place du Capitole, stands the 'Capitole,' or town hall. It dates from the sixteenth century, but has recently been almost wholly reconstructed. It possesses little architectural merit. The edifice owes its name to the city magistrates, or 'Capitouls,' who ceased to exercise their functions about the time of the French Revolution. It is the seat of the famous Académie des Jeux-Floraux—an ancient literary institution which lends especial renown to the city. These Jeux-Floraux, or Floral Games, which date from 1324, are poetical tournaments, in which the prizes allotted on May 3 of each year consist of flowers of gold and silver. In the 'Capitole' also are an academy of legislation, founded in 1851, and an academy of science, inscriptions, and belles-lettres, founded in 1640.

Near the 'Capitole' are the Municipal Theatre and a square donjon, restored by Viollet-le-Duc. The latter contains the city's archives. Farther south is the museum of fine arts, occupying in part an ancient Augustine convent. In this section of the city is the Cathedral of Saint Etienne—a curious inharmonious edifice belonging to different times and architectural types.

In the extreme southern part of the city are the Jardin des Plantes and the Jardin Royal. Here splendid, spacious avenues unite in the sightly Grand Rond, which is decorated with statues. To the west is the Palace of Justice—formerly the Palace of the Parlement, with several beautiful rooms. In the vicinity stands the statue of Cujas, the great French jurist, a native of Toulouse. Northward is the Church of La Dalbade, whose square tower, splendid Renaissance portal, and interior merit mention. Prominent among the old mansions in the vicinity is the Hôtel Lasbordes—a splendid creation of Bachelier, much of whose work is to be seen in Toulouse. Farther north, near the Pont Neuf, is the church of La Daurade. Not far away is the lycée, occupying part of the extensive Renaissance establishment of the merchant Bernuy who guaranteed the ransom of Francis I. after Pavia. In the vicinity is the Protestant church. To the north of the 'Capitole' and connected with it by the Rue du Faur, the most important street in the city, is Saint Sernin—the finest church in Toulouse. It is a superb cruciform Romanesque structure, begun in the eleventh century, and restored under Viollet-le-Duc. The splendid octagonal tower rises 210 feet, with tiers of triangular arches. Saint Saturnin, the martyred apostle of Toulouse, is buried here.

At the head of the educational institutions stands the university (q.v.). There are a splendid school of medicine, a school of fine arts, a veterinary college, an observatory, an artillery school, a museum of industrial art and antiquities, and, in addition, many learned societies which occupy now the splendid Hôtel d'Assezat, bequeathed to them in 1896. The city library has 70,000 volumes.

Toulouse is a city of wealth and prominence industrially and commercially, owing to its commanding position in the south of France. The Canal du Midi (q.v.) is here joined by the Canal Latéral, and thus commerce between the Atlantic and the Mediterranean is accommodated by water, Toulouse being the centre of this traffic. Much of the commerce from interior France to Spain also passes through Toulouse. The trade of the city is very extensive in wine and grain. There are two historic mills on the river. One is known to have existed in 1182; the other traces its origin back to the ninth century. There are a national tobacco factory, employing about 1300 persons, iron and copper foundries, a cannon foundry, and carriage and farm machinery works. Stained glass is also manufactured. The population in 1901 was 147,696.

History. Toulouse, the ancient Tolosa, was long prominent before the Romans came into Gaul. It was taken by the Consul Cæpio in B.C. 106, and he despoiled its great shrine of the rich treasures for which it had been famous. It became the chief city of the Visigoths in 419 and it fell into the hands of the Franks in 507. It was long important as the seat of the counts of Toulouse. In the early part of the thirteenth century it suffered terribly in the Albigensian troubles. In 1562 4000 Huguenots were killed in Toulouse. The Protestant Jean Calas, made famous by the noble exertions of Voltaire, was broken on a wheel here in 1762, on an unjust charge. At Toulouse Soult made an unsuccessful stand against Wellington on April 10, 1814. Consult: *Toulouse; histoire, archéologie monumentale, facultés*, etc. (Toulouse, 1887); Du Mège. *Histoire des institutions de Toulouse* (Toulouse, 1844); Jourdan, *Panorama historique de Toulouse* (Toulouse, 1877).

TOULOUSE, County of. A feudatory State, which played a prominent rôle among the principalities of mediæval France. It was established by Charles the Great in 778, and its rulers became hereditary about the middle of the ninth century. The dominion of the counts finally extended over the whole of Languedoc, over Rouergue, and over part of Guienne and Provence. Count Raymond IV. had a distinguished share in the First Crusade (1096-99). He died in 1205. His son, Bertrand, established the principality of Tripolis, on the coast of Syria. Raymond VI. (1194-1222) is celebrated as a patron of the Provençal poets and in connection with the Albigensian wars. Having refused to take severe measure against the Albigenses, he incurred the wrath of the Church, which let loose against him the crusading forces of Simon de Montfort, to whom Raymond's possessions were transferred by Pope Innocent III. Raymond was unable to make head against the invaders, who overran and laid waste his country. Simon de Montfort fell at the siege of Toulouse in 1218, and not long after Raymond succeeded in recovering a part of his lands. He enjoyed his regained power, however, only for a brief time, dying in 1222. His son Raymond VII. (1222-49) secured possession of most of the dominions of his house, but in 1229 he was forced to cede a large part to Louis IX. of France and acknowledge him as his overlord. His daughter and heiress, Jeanne, was married to the King's brother, Alphonse, Count of Poitou, on whose death, in 1271, the County of Toulouse was united with the French crown.

TOULOUSE, University of. A French university, founded as a result of the Albigensian heresy and the crusade against Toulouse, as a bulwark of orthodoxy, by Pope Gregory IX., in 1230-33. It is the first of European universities founded by deliberate purpose, and thus became the model for later foundations. It was made up chiefly of migrants from Paris, and was for many years not very prosperous. Its chief purpose was originally theological, but it developed into a noted school of law, and eventually took up the royal as against Papal interests. It was particularly rich in colleges, no fewer than ten well-endowed foundations being enumerated. At the Napoleonic reorganization it was, like other universities, merged into the national system. It includes now four regular faculties, law, philosophy, mathematics—science and medicine—pharmacy, besides the faculty of Protestant theology of Montauban, and the two 'free faculties of theology and philosophy.' In 1901 it had a budget of 1,011,613 francs and 2040 students.

TOUR, t͞oor, Maurice Quentin de la. See La Tour, Maurice Quentin de.

TOURACOO, or Touraco. Same as Turaco (q.v.).

TOURAINE, t͞oo-rān′. One of the former provinces of France, corresponding to the present Department of Indre-et-Loire. The district has received the name of the 'Garden of France.' The capital was Tours (q.v.). After having been under the rule of its own counts Touraine was united about the middle of the eleventh century with Anjou. Along with Anjou, it passed in 1154 to England. It was reacquired by France half a century later, was made a duchy in 1356, and was definitively united with the crown in 1584. See "Map of France, Showing Former Provinces," under France.

TOURANE, t͞oo-rän′, or Touran. A town of Annam, 40 miles southeast of Hué (q.v.). It is well built and extends along the left bank of the river for two miles. There are large substantial markets, a silk filature, an opium farm, etc. Numerous steamers maintain communication with Europe and the adjacent ports, and there is an extensive commerce carried on in sugar, rattan, bamboó, areca nuts, silk, and cassia. Tea, coffee, and the mulberry are cultivated in the neighborhood. Population, in 1897, 4650, of whom 100 were Europeans.

TOURASSIAN EPOCH. The name applied to an epoch of European prehistoric archæology at the end of the Paleolithic period, just before the close of the Quaternary. It is so named from the rock shelter of Tourasse, at Saint-Martory, Haute-Garonne, France. The climatic conditions were very much as at present, and the fauna of to-day was abundant. Industry and art declined and caused a hiatus between the Paleolithic and the Neolithic periods.

TOURCOING, t͞oor′kwăN′. The capital of an arrondissement in the Department of Nord, France, 7½ miles northeast of Lille (Map: France, K 1). It is practically a part of the great industrial centre Roubaix. The town has a fine modern Gothic church, a large new town hall, a chamber of arts and manufactures, and schools of painting, drawing, music, and architecture. In 1866 a monument was erected to commemorate the defeat here in 1794 of the English and Austrians by Jourdan and Moreau. The wool-manufacturing output of this district represents nearly the entire output of Northern

France. There are manufactories of velvet pile carpets, woven goods, and furniture stuffs, also cotton, linen, and silk mills, dye works, machine shops, and a sugar refinery. Population, in 1891, 65,477; in 1901, 79,243.

TOURGÉE, tōōr-zhā′, Albion Winegar (1838-1905). An American novelist, born in Williamsfield, Ohio. He graduated from the University of Rochester, N. Y., in 1862, receiving his degree while serving in the Federal Army. He had been wounded at Bull Run, and was discharged, but reëntered the service, only to be taken prisoner at the battle of Murfreesboro, Tenn. Immediately after the war he became an editor and took up the practice of law at Greensboro, N. C. From 1868 to 1875 he was judge of the Superior Court of North Carolina, and was later (1881-84) editor of *The Continent* at Philadelphia. He was appointed United States consul at Bordeaux in 1897 and was transferred to Halifax in 1903. His numerous novels were founded chiefly on his experience in the South during the Reconstruction period. The list includes: *Toinette* (1874); *A Fool's Errand*—perhaps his best-known work (1879); *Bricks Without Straw* (1880); *John Eax and Mamelon* (1882); *Hot Plowshares* (1883); *An Appeal to Cæsar* (1884); *Black Ice* (1888); *Button's Inn* (1887); *With Gauge and Swallow* (1889); *Letters to a King* (1889); *Pactolus Prime* (1890); *Murvale Eastman, Christian Socialist* (1890); *Out of the Sunset Lea* (1892); *An Outing with the Queen of Hearts* (1894); *The War of the Standards* (1896); and *The Mortgage on the Hip-Roof House* (1896). Tourgée also wrote legal books, *North Carolina Code of Civil Procedure* (1878), and *A Digest of Cited Cases* (1879).

TOURMALINE (Fr. *tourmaline*, from Singhalese *tournamal*, *turamali*, tourmaline). A complex aluminum boro-silicate, containing also chromium, iron, magnesium, and the alkalies. It crystallizes in the hexagonal system. According to composition, several varieties are distinguished, as chromium tourmaline, iron tourmaline, lithium tourmaline, magnesium tourmaline, and magnesium-iron tourmaline. It has a vitreous lustre, may be either transparent or opaque, and may be colorless as well as blue, green, red, brown, and black. Some crystals are red internally and green externally, and still others are red at one extremity and green, blue, or black at the other. Tourmaline is the most dichroitic of all gems. The mineral is usually found in granite, gneiss, or mica schist. It occurs also in dolomite, granular limestone, and in certain contact rocks near dikes of igneous rocks; also in rolled pebbles in alluvial deposits. The white or colorless tourmalines are called *achroite*, the black varieties *aphrizite* and *schorl*, while those of various shades of blue are known as *indicolite*, the red varieties as *rubellite*, and the green transparent specimens from Brazil are known as *Brazilian emeralds*. The colored crystallized varieties of tourmaline, when transparent, are highly prized as gem-stones. They are found in Burma, Ceylon, and India, in the Urals, the Harz, and Brazil, while in the United States splendid specimens occur in Maine, especially near Paris, also in Massachusetts, Connecticut, New York, and California. Consult Hamlin, *The Tourmaline* (Boston, 1873).

TOURNACHON, tōōr′nȧ′shôɴ′, Félix (1820—). A French author, artist, and aëronaut, better known under the pseudonym Nadar. He was born in Paris; studied medicine at Lyons; and returned to Paris as a journalist. In 1849 he founded the *Revue comique*, and in 1854 published *Le Panthéon-Nadar*, a gallery of contemporary celebrities. He soon afterwards engaged in experiments in aërial navigation, and constructed *Le Géant*, the largest balloon hitherto made. In it he made a number of ascensions, and was once carried as far as Hanover. During the siege of Paris by the Prussians he made use of his knowledge as an aëronaut to carry information to the outside country, and commanded the company of aëronauts of the Place Saint-Pierre, Montmartre. Among his numerous published works are: *La robe de Déjanire* (1841; 2d ed., 1859); *Quand j'étais étudiant* (1857); *Mémoires du Géant* (1864); *Le droit au vol* (1865); *Les ballons en 1870* (1871); and *Le monde où l'on patauge* (1883).

TOURNAMENT (OF. *tournoyement*, *tournoiement*, from *tournoier*, to joust, tilt, tourney, wheel about, from *tourner*, to turn, from Lat. *tornare*, to turn in a lathe, from *tornus*, from Gk. τόρνος, compasses, carpenter's chisel; connected with τείρειν, *teirein*, to pierce, Lat. *terere*, OChurch Slav. *trŭti*, Lith. *triti*, to rub). A knightly sport of the Middle Ages, in which combatants engaged one another with the object of exhibiting their courage, prowess, and skill in the use of arms. It existed first probably in France, whence it spread to Germany and England, and afterwards to the south of Europe. A tournament was usually held on the invitation of some prince, who sent a king-of-arms or herald through his own dominions and to foreign courts. The intending combatants hung up their armorial shields on the trees, tents, and pavilions around the arena for inspection, to show that they were worthy candidates for the honor of contending in the list in respect of birth, military prowess, and character. The combat took place on horseback, or at least was always begun on horseback, though the combatants who had been dismounted frequently continued it on foot. The usual arms were blunted lances or swords; but the ordinary arms of warfare, called arms *à l'outrance*, were sometimes used by cavaliers who were ambitious of special distinction. The prize was bestowed by the lady of the tournament on the knight to whom it had been adjudged, he reverently approaching her, and saluting her and her two attendants. The period when tournaments were most in vogue comprised the twelfth, thirteenth, and fourteenth centuries; and the place where the most celebrated English tournaments were held was the tilt-yard near Saint James's, Smithfield, London. The Church at first discountenanced tournaments, some of its decrees prohibiting persons from engaging in them under pain of excommunication, and denying Christian burial to a combatant who lost his life in one. The Church seems, however, to have looked with more favor on these combats after the middle of the thirteenth century. During the fifteenth and sixteenth centuries tournaments continued to be held, but the alteration in the social life and warfare of Europe had changed their character, and they are rather to be regarded as state pageants than as real combats. The death of

Henry II. of France, in 1559, consequent on the loss of his eye at a tournament, led to their general abandonment, both in France and elsewhere.

Military Tournaments. The modern military tournament embraces all the personal skill in the use of arms of the ancient chivalric tournament and has much of its pageantry. New inventions and contact with many nations have incorporated into military necessities and pastimes many novelties unknown in ancient times, and these find their supreme exposition in the national tournaments of both America and England. There is no mystery about the origin of the modern military tournament; data, place, and reason are all available. In 1878 the Staff of the Military Gymnasium, Aldershot, gave an exhibition of military exercises at the Albert Hall in London in aid of the widows and orphans of the British soldiers killed in the Zulu war. It was of necessity very limited in its functions; but the next year a fully organized competition in the use of weapons of offense and defense, between all branches of the service, cavalry, infantry, artillery, engineers, and hospital corps, was held. The programme was (and still is) practically divided into two parts: one coming strictly within the line of military duty, such as feats of strength and skill with sword, lance, sabre, and bayonet, and horsemanship, including riding and driving; the other division consisting of sports and pastimes, such as tent-pegging, mounted wrestling, etc. To such an extent did the desire to compete extend in Great Britain that it has become necessary to impose the restriction of passing through and obtaining the first place in merit in a district tournament as a condition precedent to competition at the national tournament. The peg used in tent-pegging is an ordinary wooden tent-peg three inches broad and a foot long, driven nearly perpendicular into the ground until less than one-half of it is in sight. The trooper rides at the gallop, strikes it if possible, and without relaxing the grasp of his lance or the speed of his horse, wrenches the peg out of the ground and carries it away on his lance point. In America the military tournament held each year in Madison Square Garden, New York, has become a recognized institution. It differs from the British tournament in that the latter consists of competitions as well as of exhibition performances, while in America it is made up entirely of exhibition work. The cadets of West Point invariably take part in the tournaments, which have been regularly held since 1897.

TOURNAY, to͞or'nā', or **TOURNAI.** The capital of an arrondissement and the largest town in the Province of Hainault, Belgium, 48 miles south by west of Ghent, on the Scheldt River, here spanned by several bridges (Map: Belgium, B 4). The most striking edifice is the twelfth-century Cathedral of Notre Dame, in the Romanesque style. The nave, dating from 1146, and the façade with its porch and sculptures are of special interest. Other architectural features of the town include the twelfth-century belfry, the Church of Saint Quentin, in the Transitional style, the Church of Saint Brice, with the tomb of Childeric, and the Church of Saint Jacques. The thirteenth-century bridge, the art gallery, the museum of natural history, and the old monastery buildings, now utilized as the municipal headquarters, are also noteworthy. The public library has 60,000 volumes. Manufacturing is the principal industry, the town being noted for its carpets and high-grade porcelain. Cotton and woolen goods, linen, and liquors are also produced. Population, in 1900, 37,069. Tournay, the ancient *Civitas Nerviorum* or *Turnacum*, was for a time the capital of the kingdom of the Franks. A bishopric was founded here in 484. The town was at various times and for long periods a possession of France, which finally relinquished it in 1748. It is famous for the gallant defense made by its garrison, under the Princess d'Epinoy, against Alexander of Parma in 1581.

TOURNEFORT, to͞orn'fôr', Joseph Pitton de (1656-1708). A French botanist, born at Aix, Provence. After having explored the flora of his native district, he was sent, at the King's expense, to Spain, Portugal, England, and Holland, the Grecian Archipelago, and Thrace, the shores of the Black Sea, and Asia Minor, and other parts of the East, adding many species to the list of known plants. He published several botanical works, and a *Voyage to the Levant* (1717). His botanical system, which maintained its ground till the time of Linnæus, was of great use in promoting the progress of botany; but he rendered still greater service to science by grouping plants in genera.

TOURNEUR, tẽr'nẽr, Cyril (1575?-1626). An English dramatist. He found employment in the Low Countries, and served as secretary to Sir Edward Cecil in the expedition to Cadiz (1625). He is the author of two plays: *The Atheist's Tragedie* (written about 1603; published 1611) and *The Revenger's Tragedie* (published 1607). The latter is a powerful though lurid tragedy. Tourneur also wrote elegies and other non-dramatic pieces. Consult his *Plays and Poems*, edited by J. C. Collins (2 vols., London, 1878); and the two plays edited, with Webster, by J. A. Symonds ("Mermaid Series," ib., 1888).

TOURNIQUET (Fr. *tourniquet*, turnstile, *tourniquet*, from *tourner*, to turn). An instrument for compressing an artery of the thigh or arm, either for the purpose of preventing too great a loss of blood in amputation, or checking dangerous hemorrhage from accidental wounds, or stopping the circulation through an aneurism. The common tourniquet consists of three parts —viz. (1) a pad to compress the artery, (2) a strong band which is buckled round the limb, and (3) a bridge-like contrivance over which the band passes, with a screw whose action raises the bridge and consequently tightens the band.

To prevent the loss of venous blood during an amputation, it is customary to elevate the limb to a vertical position or to strap it with an elastic bandage for several minutes before the tourniquet is applied. The older forms of tourniquet are now almost universally replaced by a simple rubber strap or piece of rubber tubing which is passed several times around the limb under tension and fastened. This general type is known as Esmarch's tourniquet.

TOURS, to͞or. A city of France, the capital of the Department of Indre-et-Loire. It is 147 miles southwest of Paris, in the rich level valley of the Loire, on the left bank of that stream, and extends two miles southward to the Cher (Map: France, G 4). The pleasant situation and the equable climate attract many English and American families as sojourners. Two great lines of boulevards, extending throughout the city, cross at its geographical centre, where the modern Palace of Justice adorns a fine square. In this square stands Fournier's bronze statue of Balzac. The famous stately French-Gothic Cathedral of Tours rises in the northeastern part of the city, near the river. It dates from 1170, was finished about 1550, and is exceptionally complete as to execution. The flamboyant turreted façade is sumptuous, and the rose window is of an exquisite pattern. Near the centre of the city are the striking detached towers of Saint Martin and Charlemagne—remains of the celebrated Church of Saint Martin marking the site of the tomb of the saint. The church was rebuilt about the twelfth century in splendid proportions. The structure was torn down in 1802, making way for a street. Near by the new Basilica of Saint Martin is being built. The ruined château Plessis-lès-Tours, identified with the life of Louis XI., and known to the lovers of Scott, lies just southwest of Tours.

The city has an art school, a large and a small seminary, the Collège de Saint Louis de Gonzaga, and a drawing school. The public library contains 100,000 volumes; also 1800 manuscripts, some of which are precious. In the archiepiscopal palace is a museum of archæology, paleontology, art, coins, etc. The Museum of Tours, near the river, has some 500 pictures of small value and collections of sculptures, enamels, antiquities, etc. The city has manufactures of steel, machinery, iron implements, silk stuffs, corsets, leather, confectionery, painted glass, pottery, and chemicals. There are printing works. The trade is very active, both by rail and by river. The population of the commune in 1901 was 58,409.

History. Tours, named from the Gallic tribe of Turones, was an active ally of Vercingetorex against the Romans. It was later the Roman Cæsarodunum. The place became at a very early date the seat of an important bishopric, which soon rose to the rank of an archbishopric. Numerous councils were held here. Tours was taken by the Visigoths in 473 and by Clovis in 507. It is famous for the momentous battle fought in the direction of Poitiers in 732, when Charles Martel (q.v.) repulsed the vast invading army of the Saracens. The city was the capital of Touraine (q.v.). It rose to great importance under the Valois kings, Louis XI. in particular favoring the city, which for a time was a great seat of the silk manufacture. The States General were repeatedly assembled here. In October, 1870, the Government of National Defense was organized at Tours, whence it was removed in December to Bordeaux. The Germans occupied the city from January 8 until March 8, 1871. Consult: Giraudet, *Histoire de la ville de Tours* (Paris, 1878); Grandmaison, *Tours archéologique* (Tours, 1879); Chevalier, *Tours capitale* (Tours, 1896).

TOURVILLE, tōōr′vēl′, Anne Hilarion de Cotentin, Count de (1642-1701). A French admiral. He was born at Tourville, near Coutances, November 24, 1642. He entered the French Navy, and became a captain at twenty-five, having distinguished himself by service against the Turks and Algerians. In 1669 he participated in the French expedition for the relief of Candia, and in 1672-73 took part in the naval war waged by the combined fleets of France and England against the Dutch. He fought with distinction at Agosta, off the coast of Sicily, in April, 1676, and received the command of a squadron with which in June of the following year he won a decisive victory over the allied British and Dutch off Palermo (June 2d). He became lieutenant-general of marine, and from 1682 to 1688 saw active service against the Barbary pirates, varied by his share in the bombardment of Genoa in 1684. In 1689 he was made a vice-admiral and commanded the French fleets in the operations against England and Holland. In June, 1690, he entered the English Channel at the head of a powerful fleet, and inflicted a disastrous defeat on the united English and Dutch armament near Beachy Head. In 1692, Louis XIV. having decided upon an invasion of England on behalf of James II., a fleet was assembled at Brest under Tourville in order to protect the descent. With 44 ships of the line Tourville assailed an Anglo-Dutch fleet of 82 vessels under Lord Russell off Cape La Hogue, and after a desperate fight was decisively beaten (May 29th). Tourville, however, suffered no discredit for this defeat, in which his talents and courage were abundantly displayed. In 1693 he was made a marshal of France, and in June defeated a British-Dutch fleet under Sir George Rooke off Cape Saint Vincent, capturing 27 ships of war and merchant vessels and destroying 45 others. He was subsequently charged with the defense of the Mediterranean coasts of France, but saw no active fighting. He died in Paris, May 28, 1701. Fraudulent *Mémoires* in Tourville's name were published in 1742-58. Consult Delarbre, *Tourville et la marine de son temps* (Paris, 1889).

TOUSSAINT, tōō′săN′, Anna Louisa Geertruida (1812-86). A Dutch novelist, born at Alkmaar, of parents descended from French Protestant refugees. In 1851 she married the architectural painter Jan Bosboom (1817-91) and thenceforth lived at The Hague. The reputation won with her first works, *Almagro* (1837), *De Graaf van Devonshire* (1838) and *De Engelschen te Rome* (1839), was enormously increased on the appearance of *Het huis Lauernesse* (1841, 10th ed. 1885), an historical romance of the Reformation, which was translated into several languages. Among her other historical novels, dealing mainly with English, Dutch, and Spanish scenes, the Leicester trilogy, *Leycester in Nederland* (1846), *De vrouwen uit het Leycestersche tijdvak* (1849-50), and *Gideon Florensz* (1854-55), is the most remarkable. Subsequently she was eminently successful with modern character delineations, of which *Majoor Frans* (1874) is an excellent example. Fine artistic workmanship distinguishes her dialogue-tale *Raymond de schrijnwerker* (1880). For her life, consult Jan ten Brink (Amsterdam, 1886).

TOUSSAINT, François Dominique, called l'Ouverture (1743-1803). A Haitian soldier and statesman. He was born near Cape Français, in the island of Haiti, in 1743, and was a full-blooded negro, his father and mother both being African slaves. He was coachman and afterwards assistant to the overseer of his master's sugar plantation, and acquired some little education, which he used to good advantage. When the French Revolution, which largely affected the fortunes of French Haiti, broke out, he was the overseer of his master, a planter named De Libertat. The population of French Haiti in 1790 numbered about 500,000, of whom 38,360 were Europeans, 28,370 free mulattoes, and the remainder negro slaves. There were thus three sharply defined castes with different interests. The Europeans jealously guarded all political privileges. The free mulattoes were nevertheless an intelligent class and large property-owners. A decree of the French Constituent Assembly, May 15, 1791, gave to all free persons of color the privileges of French citizenship, but the white planters of Haiti, an arrogant colonial aristocracy, did everything in their power to delay the application of the decree. On August 23, 1791, the slaves became a factor in the problem by rising in a fierce insurrection, which led whites and mulattoes to drop their quarrel in the face of a common danger. Toussaint took part in the uprising, and won a prominent place among the leaders of the insurrection. The revolt was temporarily suppressed, but the repeal by the French Assembly in May, 1792, of the decree of 1791, alienated the mulattoes, throwing them on the side of the negroes, and reopening the civil war. For a while Toussaint took service with the Spaniards in the east of the island, with whose aid he overran a part of the French territory. Commissioners from France attempted to settle the troubles of the island and finally proclaimed universal freedom in August, 1793. This decree was ratified by the National Convention a few months later. This won Toussaint over to the side of the French Republic, and he came to the front as the recognized leader of his race. The English at this time had seized Port au Prince, and were besieging the French Governor, Laveaux, in Port de la Paix. Toussaint went to his assistance, and it was Laveaux who, by his exclamation, *Mais cet homme fait ouverture partout*, gave Toussaint the surname *l'Ouverture*, by which he has since been known. Toussaint was made a general of division and acted with great vigor against the Spanish, who had been seeking to secure control of the western part of the island. In 1796 Toussaint was made commander-in-chief of the French forces on the island, and signalized himself in the following year by compelling the surrender of the English who had invaded Haiti. He soon came into conflict with Hédouville, the French Commissioner, whom he compelled to sail for France. Hédouville, however, had succeeded in stirring up dissension between the negroes and the mulatto element, and in 1799 a fierce civil war was waged between the blacks under Toussaint and the mulattoes under General André Rigaud. After being reduced to desperate straits Toussaint finally, in December, 1799, succeeded in crushing his opponent. By January, 1801, he had brought the whole island under his power. He now became virtually a dictator, but ruled the island with moderation and firmness, and with justice toward the different classes of the population. The prosperity of the island revived under his measures. His private life was rational and modest, but in public he assumed an elaborate state for the purpose of impressing his followers. He had an administrative council of nine, eight of whom were white men. A constitution was drawn up, providing for free trade and naming Toussaint life President. This was submitted to Napoleon, who saw in it a move toward independence (which it probably was), and determined to put down the Haitian leader. After the Treaty of Amiens had freed him temporarily of danger from England, the First Consul proclaimed the reëstablishment of slavery in the island. Toussaint replied by a declaration of independence in July, 1802. Napoleon sent General Leclerc with 30,000 men to reduce the Haitians to submission. Leclerc was joined by many of Toussaint's enemies, among them being Rigaud, and the future rulers, Pétion and Boyer. The French commander, after failing to obtain possession of Toussaint's person by treachery while conducting his campaign, sought to arouse discontent among Toussaint's followers and to bribe his officers with flattering promises. He was slowly gaining ground in this campaign of deceit and force combined, when he foolishly announced his intention of restoring slavery and thereby united the negroes once more about their leader. Leclerc then recalled his blundering declaration, promised liberty and a general representative assembly, and won over several of the negro chiefs, who were finally joined by Toussaint, anxious as he always seems to have been for the greatest good of his people. He was treacherously arrested after he had made his submission, taken to France and imprisoned without trial in the Château Joux, near Besançon, where he died April 27, 1803, from cruelty and neglect. The negroes were roused to fury by this treachery and renewed the war. They succeeded in driving out the French in the same year that Toussaint died. Toussaint l'Ouverture is perhaps the most conspicuous example of the possibilities, intellectual and moral, of the pure-blooded negro, even without especially favoring conditions. Consult the *Mémoires* by himself (1853); Saint Remy, *Vie de Toussaint l'Ouverture* (Paris, 1850); Beard, *The Life of Toussaint* (London, 1853); Gragnon-Lacoste, *Toussaint L'Ouverture, général en chef de l'armée de Saint Domingue, surnommé le premier des Noirs* (1877), based on the l'Ouverture family papers.

TOWAGE (from *tow;* connected with AS. *teon*, Goth. *tiuhan*, OHG. *zogan*, *ziohan*, Ger. *ziehen*, to draw, Lat. *ducere*, to lead). Assistance in propelling or drawing rendered by one vessel to another. Towing is usually done by tugs, but the service may be performed by any sort of a vessel. A vessel thus assisted is commonly referred to as a *tow*. A tug is not held to the strict responsibility of a common carrier, and is liable only for lack of reasonable skill in such service, and for negligence. The master of the tug is obliged to see that the tow is properly made up, having regard to the voyage to be made; must have skill in navigation, and be reasonably familiar with the course to be followed. The master of the tow must follow all reasonable orders of the master of the tug as to steering, etc. A tug should not abandon a tow, except in cases of extreme necessity, and, in general, it may be said that it must seem inevitable that the tug will be lost unless the tow is abandoned in order to justify that course. The charges for towage constitute a maritime lien upon the tow, which will follow it until paid. All questions of towage are governed by admiralty law. Consult the authorities referred to under ADMIRALTY LAW. See RULES OF THE ROAD.

TOWAN'DA. The county-seat of Bradford County, Pa., 80 miles northwest of Wilkesbarre, on the Susquehanna River, and on the Lehigh Valley Railroad (Map: Pennsylvania, E 2). It has the Susquehanna Collegiate Institute and a public library. Towanda is the shipping centre of a rich farming section, but is primarily known for its industrial interests. There are a large toy manufactory, furniture and shoe factories, a flour mill, foundry and machine shops, planing mills, etc. The government is vested in a burgess, chosen every three years, and a council. Towanda was settled in 1770, and was first incorporated in 1828. Population, in 1890, 4169; in 1900, 4663.

TOWER (AS. *tur*, from Lat. *turris*, Gk. *τύῤῥις*, *tyrris*, *τύρσις*, *tyrsis*, tower). Generally, except in fortresses (see FORTIFICATION), a building higher than its horizontal dimensions. The round towers of Ireland have been much discussed, and various fantastic explanations have been given for their appearance in the island in considerable numbers. The round tower accompanying a church in the mountain regions of Spain, or in the flatlands of Northern Italy, is admitted to be a bell-tower of an ancient type; but those of Ireland have such small window-openings that it is evident that no pains were taken to let the sound of the bells reach the community outside. These towers are, moreover, very slender, high, and costly in comparison with the very humble churches which stand near them; and the soundest conclusion seems to be that they were intended partly as watch-towers, partly as places for the deposit of valuables in the case of sudden forays. These round towers of Ireland are wholly without architectural effect. On the other hand, the Tower of Sant' Apollinare in Classe, near Ravenna, is an interesting architectural design, although it has lost its belfry story; and that of Sant' Apollinare Nuovo, within the city, is one of the most beautiful towers in Italy. Each of these bell-towers is of circular plan. Another form of round tower worthy of special note is the minaret of the Mohammedan cities. See MINARET.

In antiquity the tower was a rare thing, used only for defense, and occasionally for lighthouse purposes, though the form of those buildings is not accurately known. In the Far East the tower is associated with the double purpose of commemoration and religious sacrifice, in such builds as the Stupa and Tope (q.v.) of Southern Asia, and the Paoh-Tah or octagonal tower of China. The lofty wooden structures connected with the Buddhist temples of Japan are, like the Indian and Chinese towers, emblematic and commemorative rather than useful in any way; they are the central and culminating feature of the temple-group and no more. (For the wide use of the tower in Mohammedan architecture, see MINARET.) In the Christian world, the tower appears in Italy at an early time, and in the North at least as early as the eighth century. In the North, at least, its obvious purpose of carrying large bells high above the roofs of neighboring buildings is complicated with a certain adaptation of the structure to purposes of defense against an enemy. In Italy the detached and separate tower (see CAMPANILE) held its own until the complete disappearance of mediæval architecture in the fifteenth century; but in the North it is found incorporated with the main structure of the Church at a period at least as early as the eleventh century. The tower generally stands upon the ground, with its vertical lines easily seen from foundation to summit; and this remains true throughout the Middle Ages except for the central towers of the cruciform churches. These last-named towers are built over the open interior, and are supported on four great arches or groups of arches, two of which span the nave, springing across the church from side to side, while two others continue the wall of the nave longitudinally. The complete Gothic cathedral has at least seven towers, two to the west front, four to the transept fronts, and one over the crossing. These towers all resemble one another in their appearance as seen from without. Throughout Italy the classically designed churches are apt to retain their mediæval campanili. Consult Sutter, *Turmbuch* (Berlin, 1895).

TOWER. tou'ĕr, CHARLEMAGNE (1848—). An American capitalist and diplomat, born in Philadelphia. He was educated at Harvard. From 1882 to 1887 he was president of the Duluth and Iron Range Railroad and managing director of the Minnesota Iron Company. He then removed to Philadelphia, where during the next ten years he was an officer in various important corporations. He was United States Minister to Austria-Hungary from 1897 to 1899, and was Ambassador to Russia from 1899 to 1902, when he replaced Andrew D. White (q.v.) as Ambassador to Germany. He published: *The Marquis de La Fayette in the American Revolution* (2 vols., 1895); and *Catalogue of a Collection of American Colonial Laws* (1890).

TOWER, ZEALOUS BATES (1819-1900). An American soldier, born at Cohasset, Mass. He graduated with first honors at West Point in 1841; served under General Scott in the Mexican War; led the storming column at Contreras, and was wounded at Chapultepec. At the outbreak of the Civil War he was chief engineer in the defense of Fort Pickens. In November, 1861, he was made brigadier-general of volunteers, and on August 30, 1862, was severely wounded at Manassas. After recovering he was superintendent of West Point from July until September, 1864. He then became chief engineer of the defenses of Nashville, Tenn., and his skillful work at that place contributed to the total defeat of General Hood in December, 1864. He was brevetted major-general in the United States Army in March, 1865, and in November of that year became lieutenant-colonel in the engineer corps. He was promoted colonel in January, 1874, and retired in 1883.

TOWER BRIDGE. A drawbridge spanning the Thames just below the Tower of London, opened in 1894. The carriageway, at a height of 29½ feet, consists of two approaches of 270 feet, and a central span of 200 feet, with a rising draw formed by twin bascules, which can be raised in 1½ minutes. There is an elevated footway above the draw, which is used when the draw is open, 142 feet above the river, reached by elevators and stairs. The Gothic towers are of steel and masonry. The cost was over £1,000,000.

TOWER HILL. An elevation northwest of the Tower of London, formerly the public place of execution for persons sentenced for treason. Here many of the most noted men of England were put to death, their bodies being buried in the adjacent Chapel of Saint Peter ad Vincula.

TOWER OF LONDON. In feudal days a powerful fortress, and long afterwards a State prison of gloomy memories. It is now a Government storehouse and armory. It is a collection of buildings in the form of an irregular quadrilateral on rising ground adjoining the Thames, on the north bank and immediately to the east of the City of London. The space occupied is between twelve and thirteen acres, and the whole is surrounded by a broad but shallow moat. Usually the moat is dry, but the garrison can flood it by sluices from the Thames. The moat is bordered within by a lofty castellated wall, with massive flanking towers at frequent intervals. Within this wall rises another of similar construction, but of greater height, within which are the various barracks and armories; and in the centre of all is the lofty keep or donjon known as the White Tower. This last named building, erected by the Bishop of Rochester, in the time of William the Conqueror, is the most interesting in the whole structure. Its walls are in parts 16 feet thick, and of solid masonry. The White Tower was the Court of the Plantagenet kings, whereas the various other towers are principally noteworthy on account of the illustrious prisoners who have been confined in them. In the northwest corner of the quadrangle is Saint Peter's Chapel, now the garrison church. In another part is the Jewel Office, containing crown jewels of enormous value, crowns, sceptres, golden dishes, tankards, saltcellars, and other plate and jewelry. Near this building is the Horse Armory, which contains a collection of ancient and mediæval arms and armor, the latter exhibited in complete suits on wooden figures of men and horses. Some of these figures represent English kings arrayed in the armor which the kings actually wore while living. To the Jewel Office and the Armory visitors are admitted on payment of a small fee.

Early writers have alleged that Julius Cæsar built the Tower of London as a Roman fortress. The spot was in fact occupied by some structure before the time of William the Conqueror, as is shown by the massive foundations discovered in the course of later erections; but of the nature of these earlier buildings we know little. The White Tower, already mentioned, is the beginning of the historical Tower of London. During the reigns of the first two Norman kings, the Tower seems to have been used as a fortress merely. In Henry I.'s time it was already a State prison. That monarch and his successors gradually increased the size and strength of the ramparts and towers, until the whole became a great feudal stronghold. The kings frequently lived there, holding their courts, and often sustaining sieges and blockades at the hands of their rebellious subjects. On the accession of Queen Elizabeth, however, the Tower ceased to be a palace. Of the long list of executions for political offenses which it witnessed, those of Lords Kilmarnock, Balmerino, and Lovat, after the rebellion of 1745, were the last.

In 1841 a fire broke out in the Bowyer Tower, and extended to the armories, causing the destruction of numerous modern buildings and many thousand arms. At present the Tower of London is in charge of the War Department, and contains arms and accoutrements for the complete equipment of a large army. The mint and public records were formerly kept in it, but have now been removed to more suitable buildings. The government of the Tower is vested in a constable, who has great privileges, and is usually a military officer of long service and distinguished rank, whose position is honorary; the deputy constable, also an officer of repute, is the actual governor. He has under him a small staff and the corps of yeomen of the guard, more commonly known as 'beef-eaters.' (See BEEF-EATER.) Consult: Dixon, *Her Majesty's Tower* (London, 1869-71); Loftie, *Authorized Guide to the Tower of London* (London, 1886); Temple, *Tower of London, Its History and Contents* (London, 1876).

TOWER OF THE WINDS. An octagonal building, north of the Acropolis of Athens, belonging to the second or first century B.C. The tower, 42 feet high and 26 feet in diameter, bears on the upper part of each side the representation of a wind. It was originally surmounted by a bronze weather-cock in the form of a Triton. Besides indicating the direction of the wind, the exterior walls were marked to serve as a sundial, and there appears to have been connected with the tower a water clock, the method of operating which has not been clearly ascertained.

TOWER-SHELL. One of the elongated, tightly coiled shells of the gastropods of the family Turritellidæ, allied to Vermetus (see WORM-SHELL), about 100 species of which are known from the warmer seas, and many fossil forms. Most of them are covered with a brownish epidermis, which, when removed, exhibits a delicately sculptured and often finely colored surface. Only the lower part of the spiral is occupied by the adult animal, the distal half of the shell being partitioned off.

TOWER-SHELL.

TOWERS OF SILENCE. The structures upon which the Parsis (q.v.) and Ghebers (q.v.) expose the bodies of their dead to be devoured by vultures or dogs in accordance with the precepts of their religion as taught by Zoroaster (q.v.). The prescription for building these structures is as old as the Avesta (q.v.) where they are described and called Dakhmas. The best modern specimens are to be seen on Malabar Hill, Bombay, India, and across the Bombay Harbor at Ooran; there is also one near Teheran and another near Yezd in Persia, where the ruins of a deserted 'tower' are likewise to be seen. The older shape of the Dakhmas seems to have been rectangular; the modern towers are circular, but less high than might be imagined. The best constructed are of massive stone or of bricks covered with cement. They are 20 or 30 feet high, 75 to 100 in diameter, and they resemble huge gas reservoirs in form. The top is open to the sky; the floor below is built of large slabs resembling flagging-stones; in each slab is a slight depression called a *pavi* in which the body is laid for the 'heaven-sent birds' to devour. Small ducts lead from every pavi into the central pit where the bones are placed after the body has been denuded of flesh by the vultures, which is accomplished in a few hours. From this central well there run four carefully constructed drains, at right angles, to carry away any deposit that might remain and conduct it through chalk, quicklime, sand, and other absorbents lest the earth might be defiled by its contact. There is little, however, to be led off thus, for the tropical sun soon parches the bones and reduces them to dust. Herodotus (*Hist.* i. 140) alludes to this method of disposing of the dead in ancient Iran, and the Zoroastrians, who have kept it up till the present day, maintain that it is a solution of the sanitary question even in plague times. See Karaka, *History of the Parsis* (London, 1884); Modi, *A Tower of Silence* (Bombay, 1885); Jackson, "The Parsee Towers of Silence," in the *Evening Post*, June 8 (New York, 1901).

TOWLE, tōl, George Makepeace (1841-93). An American historian and journalist, born in Washington, D. C. He graduated at Yale in 1861, and at the Harvard Law School in 1863, and practiced law in Boston. He was United States consul at Nantes (1866-68), and at Bradford, England (1868-70), was editor of the Boston *Commercial Bulletin* (1870-71), an editor of the Boston *Post* (1871-76), and later was connected with *Appleton's Journal*, *The Art Journal*, and *The Youth's Companion*. His works include: *History of Henry the Fifth, King of England* (1866); *The Eastern Question* (1877); *Principalities of the Danube* (1877); *Beaconsfield* (1878); *Young Folk's Heroes of History* (1870-82); *Modern France, 1851-79* (1879); *Certain Men of Mark* (1880); *England and Russia in Asia* (1885); *England in Egypt* (1885); *Young People's History of England* (1888); and *Young People's History of Ireland* (1887).

TOWN (AS. *tūn*, OHG. *zūn*, Ger. *Zaun*, hedge, inclosure; connected with Ir. *dūn*, Welsh *din*, hill fort). The name applied generally throughout the United States to small municipalities or urban communities between the village and the city. In New England it more often denotes a quasi-corporate area, either urban or rural, constituting a subdivision of the county, which elsewhere is usually called the township or supervisor's district. (For the urban town, see Municipality, or Municipal Corporation.) The New England town is the most important local administrative unit in the governmental system. The centre of political activity is the 'town meeting,' which meets usually once a year and may be attended by all the legal voters of the town. It discusses measures of common interest to the town, elects the town officers, and votes the taxes for the ensuing year. The government of the New England town is, therefore, a pure democracy, and the only real example of the kind in the American political system. The 'town meeting' governs through a body of officers, varying according to the needs of the community. These are usually the selectmen, varying in number from three to nine, who are the executive magistrates of the town, the town clerk, treasurer, constables, tax assessors, overseers of the poor, and school trustees. In some towns there are such officers as field drivers, pound-keepers, fence-viewers, measurers, sealers, etc. In England the word town applies to the small municipalities as in the United States, although the word borough is used to designate certain of the old towns. See Township. Consult: Ashley, "The Anglo-Saxon Township," in *Quarterly Journal of Economics*; Adams, *Study of Church and Town Government* (1892); Bryce, *American Commonwealth* (London and New York, 1900).

TOWN HALL. A building for the legislative and administrative business of a town or city. In the wider sense it comprises two chief divisions, the public offices of the Mayor and various municipal administrations, and the chambers for the meetings of the legislative bodies of the city (Aldermen and Council). In small towns court rooms and a jail are added, and a large public hall is also often provided. A belfry and clock-tower is a feature of nearly all French, German, Flemish, and British town halls, and of many of the more notable American examples. The French treat with especial effectiveness the entrances, lobbies, and grand stairways of their town halls.

The oldest examples of the town hall in Europe belong to the Middle Ages. They date from the time of recognition of the right of municipal self-government, of which they are the expression. In Southern France the town hall of Saint Antonin (twelfth century) is one of the oldest in Europe. In Italy there grew up by the thirteenth century almost as many States as cities, each of which provided itself in time with one or more municipal buildings according to its particular form of administration. Of these the greater part date from the late thirteenth and the fourteenth centuries, some of the most important being those at Cremona (1245); at Sienna the superb red brick Palazzo Pubblico with its slender tower (1289); at Pistoia the two palaces del Podesta and del Comune (1294-1385); at Florence the vast Palazzo Vecchio (1298), with its impressive tower overhanging the street; the Doge's Palace at Venice; the elegant Palazzo del Consiglio at Verona (1473). The Renaissance added but few to the Italian list. In Germany the *Rathaus* or Municipal Council house appears in the fourteenth century (e.g. Brunswick), but the finest and most numerous examples belong to the Renaissance, as at Bremen, Cologne, Lübeck, Altenburg, Augsburg, and Nuremberg, with picturesque towers and high gables. But few mediæval town halls remain in France, that of Compiègne being the finest (late fifteenth century).

The Renaissance gave France the fine town halls of Beaugency, Rheims, Rouen, Lyons, and Paris, the last two now replaced by modern edifices, recalling the original structures. The Paris example is the largest and most splendid of modern town halls, especially in its interior decorations. Very notable are the sumptuously ornate Belgian town halls of the fifteenth century at Brussels, Louvain, Ghent, Bruges, and Oudenarde and the fine Renaissance structure at Antwerp. In Great Britain it was not until the nineteenth century that the town hall became important; it forms one of the most interesting and successful subjects of recent architectural design, as, for example, at Sheffield and at Oxford. The splendid new town hall at Hamburg is the finest of recent German works in the same line, far superior to the modern Gothic town hall at Vienna.

In the United States the Philadelphia City Hall is the largest and ugliest of modern examples; that at New York, dating from 1809, one of the most refined and elegant. The earlier town halls of the United States follow Colonial or 'Greek revival' models; the more recent are in the style of the French Renaissance or in what may be called the neo-Roman style. The majority lack distinctive architectural merit of a high order, but recent designs show improvement, and there are a few among them worthy of high praise. See MUNICIPAL ARCHITECTURE.

TOWN'LEY, CHARLES (1737-1805). An English collector of classical antiquities, born in Lancashire. He was educated on the Continent under the tutorship of John Tuberville Needham, and upon visiting Rome and Florence, in 1765, became interested in the study of antiquities. He received much helpful advice from Winckelmann and other archæologists, and in 1768 began his collection of antiquities. After returning to England in 1772, he bought two houses in London, where he established his museum. He made frequent visits to Rome, and until 1780 continued to add to his acquisitions, including the Nollekens (q.v.) collection. In 1786 he was made a member of the Society of Dilettanti, and in 1791 trustee of the British Museum. He died in Westminster, January 3, 1805. The Townley marbles and terra-cottas were purchased for the British Museum for £20,000, and in 1814 his bronzes, coins, gems, and drawings were also acquired. His collections in the Museum are described and illustrated by Ellis, *Townley Gallery* (London, 1846).

TOWNLEY, JAMES (1774-1833). An English minister of the Wesleyan denomination. He was born in Manchester. His early education was gained in the school of the Rev. David Simpson, of Macclesfield. He joined the Wesleyan Conference in 1796, and was elected secretary of the Wesleyan Missionary Society, 1827. As a scholar he was second only to Adam Clarke in the denomination. His most important work was *Illustrations of Biblical Literature, Exhibiting the History and Fate of the Sacred Writings, Including Notices of Translators and Other Eminent Biblical Scholars* (3 vols., 1821; 2 vols., 1842).

TOWNLEY, JAMES (1714-78). An English clergyman, born in Barking, near London. He was educated at the Merchant Taylors' School, London, and at Saint John's College, Oxford. After holding various preferments in the Church, he was appointed, in 1760, head-master of the Merchant Taylors' School, and in 1772-77 was vicar of Hendon, in Middlesex. He is best remembered as the author of the satirical farce *High Life Below Stairs* (Drury Lane, October 31, 1759), which has been translated into French and German, and has been performed throughout the world. It was formerly attributed to Garrick. Two other farces written by Townley did not succeed. Consult Genest, *Account of the English Stage*, vol. iv. (Bath, 1832).

TOWNS'END, EDWARD WATERMAN (1855 —). An American journalist and novelist, notable for his studies of lower New York life and dialect. He was born in Cleveland, Ohio. After a common-school education, he became engaged in journalism in New York, and attracted attention by sketches of Bowery life done in the picturesque slang of the streets, and contributed to the *Sun* and the *Journal*. These are collected in part under the titles *Chimmie Fadden and Major Max* (1895); *Chimmie Fadden Explains, Major Max Expounds* (1895); and *Near a Whole City-Full* (1897). *A Daughter of the Tenements* (1896) and *Days Like These* (1901) are novels, also of New York life. Later books are *Chimmie Fadden and Mr. Pard* (1902) and *Lees and Leaven* (1903).

TOWNSEND, GEORGE ALFRED (1841—). An American journalist, born in Georgetown, Del. He was educated in Philadelphia, and was successively connected with the *Inquirer* and *Press* of that city, the New York *Herald* and *World*, and the Chicago *Tribune*. He first gained distinction as a war correspondent. Among his books the most noteworthy are: *Campaigns of a Non-Combatant* (1865); *Poems* (1870); *Washington Outside and Inside* (1871); *Tales of the Chesapeake* (1880); *The Entailed Hat* (1884); and a drama, *President Cromwell* (1885). Much of his newspaper correspondence was over the signature Gath.

TOWNSEND, LUTHER TRACY (1838—). A Methodist Episcopal theologian, educator, and author. He was born at Orono, Me., graduated at Dartmouth College, 1859, Andover Theological Seminary, 1862, and served as adjutant in the army, 1863-64. He entered the New England Conference, 1862, was professor of Hebrew and Greek in Boston University School of Theology, 1867, professor of historical theology, 1868, professor of practical theology, 1869-93, emeritus 1893—. The best known of his publications are: *Credo* (1869); *Sword and Garment* (1871); *The Supernatural Factor in Revivals* (1877); *The Intermediate World* (1878); *Pulpit Rhetoric* (1886); *Story of Jonah in the Light of Higher Criticism* (1897); *Evolution in Creation* (1899); *Anastasis* (1900).

TOWNSEND, THOMAS SEAMAN (1830—). An American compiler, born in New York City. From 1860 to 1901 he collected and arranged all important items concerning the Civil War that appeared in the newspapers of the country, thus forming a chronological history of incalculable value to future historians. This enormous collection of one hundred and twenty-five volumes is now in the Columbia University Library. It is entitled the *Townsend Library of National, State, and Individual Civil War Records*. He published *Honors of the Empire State in the War of the Rebellion* (1889).

TOWNSEND, WILLIAM KNEELAND (1849—). An American jurist, born at New Haven, Conn. He graduated at Yale College in 1871 and the Yale Law School in 1874. He engaged in legal practice at New Haven, and in 1892 was appointed judge of the United States District Court for the District of Connecticut, and in 1902 judge of the United States Circuit Court, second circuit. In 1881 he became professor of the law of contracts at Yale. He wrote *The New Connecticut Civil Officer.*

TOWNSEND'S WARBLER. A wood-warbler (*Dendrœca Townsendi*) of the Pacific Coast of the United States, black and yellow in color (see Colored Plate of WOOD-WARBLERS), and having the general habits of its congeners. (See WARBLER.) It is not numerous, and lives in the mountain forests. This and several other birds of the West owe their names to the naturalist J. K. Townsend, who, in 1834, in company with Thomas Nuttall (q.v.), traveled overland to the Pacific Coast and brought to the notice of science many novel species of animals.

TOWNSHEND, toun′zend, CHARLES, second Viscount (1674-1738). An English statesman. A descendant of a very ancient English family of Norfolk, he succeeded to the peerage in 1687, was educated at Eton and King's College, Cambridge, and took his seat as a Tory in the House of Lords in 1697. He was named by the Godolphin Administration one of the commissioners for arranging the union with Scotland (1706); was joint plenipotentiary with Marlborough at Gertruydenberg; and negotiated with the States-General in 1710 the Barrier Treaty, which pledged the States-General to the Hanoverian succession, and England to procure the Spanish Low Countries for the United Provinces, as a barrier against France. In 1712, upon the formation of the Harley Ministry, Townshend was dismissed from his places, and the Barrier Treaty was censured by the House of Commons, which voted that Townshend and all who had been concerned in the treaty were enemies to the Queen and kingdom. This persecution raised him from the rank of a follower to the station of a leader. He maintained a close correspondence with the Court of Hanover, and obtained the entire confidence of George I., who on his accession to the throne of England made Townshend Secretary of State, with power to name his colleagues. He selected General, afterwards Earl, Stanhope, and formed a Ministry entirely Whig in its party character. He strengthened it by the addition of Walpole, who, from being at first paymaster of the forces, was soon made Chancellor of the Exchequer and First Lord of the Treasury. Through misrepresentations on the part of his colleagues, Townshend lost favor with the King, and was, in 1716, dismissed from office. After the breaking up of the South Sea Bubble, and the death of Sunderland (q.v.) and of Stanhope, Townshend again (1721) became Secretary of State. But he was no longer the acknowledged leader of the Whigs. The superior talent of Walpole, his financial abilities, and his influence in the House of Commons, caused a change in the relative position of the two Ministers, and converted the two men into rivals and enemies. Townshend, resigning the contest, retired to Rainham, to cultivate his paternal acres. "Never Minister had cleaner hands," said Chesterfield; and his reputation for both private and public integrity remains unsullied.

TOWNSHEND, CHARLES (1725-67). An English statesman. He was the second son of the third Viscount Townshend, and was educated at Leyden and probably also at Oxford. He entered Parliament in 1747, and attaching himself to Lord Halifax, he was given by him a position in the Board of Trade in 1748. In 1754 Townshend was made a Lord of the Admiralty, but resigned the following year. Becoming a member of the Privy Council under Pitt in 1757, upon the dissolution of the Whig Government in 1761 he was won over by Bute with an offer of the post of Secretary of War. On Bute's resignation in 1763 he was appointed president of the Board of Trade. After opposing the Grenville Administration he accepted the position of Chancellor of the Exchequer under Pitt in 1766. But Pitt soon lost control over his colleagues by his acceptance of the peerage and his long periods of illness, so that Townshend began to advocate measures to which Pitt was opposed. In 1767 his first budget was rejected, and he thereupon proposed those taxes on certain goods imported into America which ultimately caused the Revolution. Townshend himself did not live to see this result, but died suddenly on September 4, 1767. He was ranked as an orator with Pitt, and was far more popular than the Great Commoner with the House of Commons. At present he is chiefly remembered on account of the policy which led to the American Revolution. Consult: Fitzgerald, *Charles Townshend, Wit and Statesman* (London, 1866); Cobbett, *Parliamentary History of England to 1803* (London, 1806-20).

TOWNSHIP (AS. *tūnscipe,* from *tūn,* inclosure, town + *-scipe,* Eng. *-ship*). A minor political or territorial division in England and the United States. In England, in Anglo-Saxon times, as a political unit it was known as the *tunscipe;* as an ecclesiastical area it was the parish. As a political unit it had a popular assembly (tun moot); as an ecclesiastical unit it had a vestry meeting. The chief executive officer was the tun reeve. He with the priest and four other persons represented the township in the popular assembly of the hundred and county. Upon the settlement of the American colonies the township was transplanted to America, and still survives, like many other political institutions of English origin. Here it is a subdivision of the county, and its political importance varies with the locality of the State. In New England, under the name of the town, it plays a far more important part in the work of the local administration than the county—in fact, it performs most of the business of local government which in the Southern States is attended to by the county. (See TOWN.) In the Middle and Western States the township plays a somewhat less important part in the work of the local government than it does in New England, the county there sharing with the township many of the important functions of local government.

In the Southern States the township is not an administrative unit of much importance. On account of early social and political conditions there, the county has been from the first the chief unit of local government, although there are signs of development in the Southern township which may increase its administrative importance in the future. In some of the Middle and Western States the town meeting exists, having been transplanted from New England. Elsewhere the chief governing authority is a township board. The township has a quasi-corporate capacity, being able to own real estate and to sue and be sued, but in performing public governmental duties it acts for the State and cannot be held liable for the negligence or tortious acts of its agents. The word township is also applied to the units of the Congressional survey in some of the Southern and Western States, these being rectangular areas 6 miles square, each of which is subdivided into 36 sections containing 640 acres. (See diagram under SURVEYING.) This is probably the most simple system of land division yet established. The Congressional township, as it is sometimes called, is not a public corporation or juristic personality, but a geographical convenience. Consult: Ashley, "The Anglo-Saxon Township," in *Quarterly Journal of Economics;* Bryce, *American Commonwealth* (London and New York, 1900).

TOWNS'VILLE. A fortified seaport on the east coast of Queensland, Australia, situated on Cleveland Bay, at the mouth of Ross Creek, 748 miles northwest of Brisbane (Map: Queensland, E 5). It has a cathedral, court-house, technical school, barracks, etc. Its industrial establishments include foundries, distilleries, and meat-packing establishments. It is the terminus of the railway from Hughenden, 236 miles inland, and has an extensive shipping trade; the harbor is tidal, and has been much improved by two long breakwaters, large vessels being enabled to enter. Population, in 1901, 12,717.

TOW'TON. A parish in Yorkshire, England, about 11 miles southwest of York, noted as the scene of a decisive victory gained by the Yorkist forces under Edward IV. and the Earl of Warwick over the Lancastrians, commanded by the Duke of Somerset and the Earl of Northumberland, March 29, 1461. The battle is said to have been the most sanguinary ever fought on English soil and according to a contemporary statement twenty-eight thousand men were left dead upon the field. The victory secured Edward IV. (q.v.) in possession of the throne. See ROSES, WARS OF THE.

TOXICOLOGY (from Gk. τοξικόν, *toxikon*, poison, neu. sg. of τοξικός, *toxikos*, relating to the bow, from τόξον, *toxon*, bow, so called because first used to poison arrow-points + -λογία, *-logia*, account, from λέγειν, *legein*, to say). The branch of medical science which treats of the nature of poisons, of their morbific effects on the animal system, of their detection in the organs or tissues of the body, of their antidotes, of the treatment of poisoning, and, finally, of the legal questions connected with poisoning. A poison may be defined as any substance which when applied to the body or introduced into the system, in whatever manner, produces death or serious bodily harm. Poisons may enter the body in various ways. The mouth is the usual channel. Poisons may be absorbed by the skin in amounts sufficient to cause death or severe toxic symptoms, as in the case of lotions or salves containing opium, corrosive sublimate, arsenic, carbolic acid, etc. Gaseous or volatile poisons may enter the lungs through the inspired air, e.g. illuminating gas, carbon monoxide, or chlorine. Poisons may gain access to the circulation through ulcerated surfaces or wounds; by direct injection into the tissues, as by hypodermic injection, poisoned arrows, or snake-bites; or they may be introduced by way of the mucous membrane of the rectum, vagina, urethra, nose, or eye.

Most medicinal agents are poisonous if taken in sufficient quantity, and this quantity varies with the individual, the state of bodily health, fullness or emptiness of the stomach, habit, and other circumstances. The influence of habit is shown by opium habitués who take enormous doses of the drug without immediate evil effects. A special susceptibility to certain substances is noted in some individuals. This is called idiosyncrasy. Thus, five grains of quinine have nearly killed certain persons, or produced unpleasant symptoms, as blindness or deafness, in others. Races and individuals, on the other hand, may possess or attain a high degree of immunity to particular poisons; e.g. the Oriental is much less susceptible to opium than the European, and the latter bears alcohol better than savage races. In certain diseases there is a diminished susceptibility to the action of particular poisons, while in others there is increased sensibility. Thus in tetanus (q.v.), hydrophobia, mania, or delirium tremens, doses of various sedatives may be given with benefit which would in health prove fatal; on the other hand, when there is a predisposition to apoplexy an ordinary dose of opium may cause death. Some poisons are harmless when taken into the stomach, but violently toxic when injected beneath the skin.

Poisons may be classified according to their chemical properties or their physiological action. The latter is the usual and most satisfactory basis, and depends upon the effects of poisons upon the system when it is in a healthy condition. According to the physiological classification poisons are divided into two great groups, viz. (1) the *irritants* and (2) the *neurotics.* An *irritant* poison is one which when swallowed produces an irritant effect upon the mucous membrane of the alimentary canal, resulting in nausea, vomiting, purging, pain in the abdomen, cramps in the stomach and other parts of the body. This group is subdivided into (a) *corrosives*, whose action is chiefly local, and (b) the *true irritants*, whose local effects may be slight, but which produce their characteristic effect after absorption. Many drugs act in both ways; for example, oxalic acid and carbolic acid. A *neurotic* poison is one which acts chiefly on the nervous system, producing drowsiness (narcotic), giddiness, headache, delirium (deliriant), stupor, coma, convulsions (tetanic), or paralysis.

Before proceeding to a systematic consideration of poisons a few principles of the general treatment of poisoning may be given. The indications are (1) to neutralize and render harmless the poison by the administration of the proper antidote (q.v.); (2) to remove the poison from the body by inducing vomiting or washing out the stomach; (3) to combat the effects of the poison already absorbed, by giving drugs which are physiologically antagonistic to the one absorbed, and supporting life until the body rids itself of the poisonous substance through the natural excretory channels. Antidotes affect a poison either mechanically or chemically, or both, so as to remove it from the body or alter its character before absorption and thereby prevent its toxic action upon the organism. Mechanical antidotes include the use of the stomach tube or pump, the employment of emetics, cathartics, stimulants, injections, ligations, etc. The true or chemical antidotes include albumen, milk, charcoal, soap, starch, oils, tannin, turpentine, acids, alkalies, potassium, permanganate, sodium, chloride, iodine, iron, etc.

When a poison has been taken by the mouth the stomach should be emptied immediately by means of the stomach tube or emetics, except where there is severe corrosion and perforation of the stomach is feared. A prompt and certain emetic is apomorphine, which has the advantage of acting when given hypodermically. Domestic resources are usually limited to giving large draughts of mustard and warm water, warm milk in large quantities, oils, butter, and lard, common salt solution, soapsuds, and these often act with great promptness. Ipecac in the form of the syrup is found in most households and may be given in doses of one or two tablespoonfuls to adults or as many teaspoonfuls to children. It is a safe and unirritating emetic, but is too slow for emergencies. Other useful emetics are copper sulphate, zinc sulphate, turpeth mineral, and alum. In poisoning it is better to use almost any emetic at once than to lose valuable time getting just the right one. When poisoning is due to irritants after evacuation of the stomach, bland and viscid fluids should be given to protect the walls of the alimentary tract and allay inflammation. These agents are called demulcents, and include flaxseed tea, white of egg, milk, barley water, and the like. Where the poison has gained entrance by inoculation, as in the case of dog-bites or the stings of reptiles, the part should be washed, sucked, and a ligature applied about the extremity above the wound, i.e. between it and the heart. The wound should then be thoroughly cauterized.

The stomach having been emptied, the next step is to administer the proper antidote or physiological antagonist. (See ANTIDOTES.) In general it is to be remembered that alkalies counteract acids and *vice versa*, since they tend to form harmless salts. Poisoning by the irritant metallic salts is best treated with albumen, in the form of white of egg, an inert, insoluble albuminate being formed. The antidote for the vegetable alkaloids is tannin, most conveniently given in the form of strong green tea. Chemical antidotes act only on such portions of the poison as have not been absorbed by the stomach and must be given promptly to be of any use.

Physiological antidotes or antagonists follow the poison into the circulation and combat its effects as long as it remains in the body.

CORROSIVE POISONS include acetic, carbolic, chromic, lactic, oxalic, and salicylic acids; concentrated mineral acids (sulphuric, nitric, etc.); creosote; corrosive sublimate; the caustic alkalies (potassium and sodium dioxide, usually in the form of lye, ammonia, etc.); quicklime; potassium chlorate; and potassium nitrate. These act either on the surface of the body, causing deep and painful destruction of tissue, or internally, by producing intense gastro-enteritis and collapse. The symptoms common to the group are nausea, vomiting, pain, and purging, the vomited and dejected matters being mucous, serous, or bloody. The mouth and lips, hands and face, are frequently burned and corroded. Treatment consists in neutralizing the poison and the giving of demulcents. In the case of weak acids, magnesia, chalk, soap, and dilute ammonia may be given as antidotes; in the event of alkaline poisoning weak acids, such as dilute vinegar or lemon juice, may be given. When the poison is concentrated the stomach tube should not be used. Carbolic acid is probably the most frequently used of the corrosives, and is best antidoted with alcohol diluted and given up to four ounces. The sulphate of magnesia is also a perfect antidote.

TRUE IRRITANTS include, besides certain of the corrosive poisons already mentioned, bromine, cantharides, croton oil, chlorine, antimony, arsenic, copper chromium, lead, tin, zinc, phosphorus, and iodine. In concentrated form most of them cause irritation to the gastro-intestinal tract, but besides this show a specific action on various organs after their absorption by the blood. *Arsenic* is the most commonly employed of this group, accidentally or with homicidal or suicidal intent. The substance is widely used in the arts and is a constituent of some vermin exterminators. Poisoning may be acute or chronic. In acute cases the symptoms are those common to irritant poisons. The chemical antidote is known as 'arsenic antidote,' and may be prepared by adding ammonia water to tincture of iron. It must be freshly prepared. Arsenic poisoning is generally fatal, a small dose (1 to 3 grains) being sufficient to kill. Chronic poisoning by arsenic is also common as a result of inhalation or contact with the various arsenical greens used in coloring wall papers, carpets, etc., grinding arsenic in mills, and from vapors in smelting copper. The symptoms are gastric irritation, cough, sneezing, throat troubles, gradually failing health, and paralysis. See ARSENIC.

Lead poisoning may also be acute or chronic, the latter being the most usual form. Acute cases are due to the ingestion of the acetate (sugar of lead), carbonate, oxide, or chromate of lead and mainly painters suffer. The prominent symptoms are gastro-intestinal irritation, cramps in the legs and abdomen, followed by paralysis of the extremities, convulsions, and coma. The sulphate of magnesia (Epsom salt) is the antidote, forming an insoluble sulphate of lead, and acting in addition as a purge. Chronic poisoning arises from handling paints, drinking water conducted in lead pipes, the use of cosmetics containing lead, and eating canned foods contaminated by solder. The symptoms come on insidiously and consist of a peculiar griping colic (lead colic), obstinate constipation, muscular cramps, paralysis of the extensor muscles of the forearms (wrist-drop), and a blue line at the junction of the gums and teeth. Chronic poisoning is treated by removing its source, and by the administration of Epsom salt and potassium iodide to eliminate the lead already absorbed. See LEAD.

Phosphorus poisoning is due to yellow phosphorus, commonly derived from matches or rat poisons. Workers in match factories are most usually attacked, although rat poison is sometimes taken with suicidal intent. The poison is very active and recovery is rare. The prominent symptoms in acute poisoning are vomiting of matters luminous in the dark, a smell of phosphorus in the breath, inflammation of the stomach and intestines, jaundice, convulsions, and coma. Treatment consists in washing out the stomach and the administration of old oil of turpentine, or potassium permanganate.

POISONOUS FOODS. There is a rather large group of foods which, owing either to their inherent properties (mushrooms and other fungi) or to the development of putrefactive bodies within them (ptomaines), produce symptoms of severe poisoning when eaten. The symptoms are very diverse, but intense gastro-intestinal irritation is common to all of them, and they may therefore be appropriately classed as irritants.

Mushroom poisoning arises through mistaking various fungi, such as mushrooms, toadstools, and truffles, for edible varieties. The toxic substance in many of these is muscarine, a deadly alkaloidal poison, producing violent vomiting, colic, thirst, dyspnœa, paralysis, and death.

Ptomaine poisoning is due to the products of putrefactive decomposition in animal or vegetable matter. The ptomaines are alkaloids and resemble chemically many of the vegetable alkaloids, thus leading to confusion or error in toxicological investigations. Not all ptomaines are poisonous and not all food poisons are ptomaines. The foods which sometimes produce symptoms of poisoning, whether ptomaine or other, are corned beef, sausage, pickled or decaying fish, putrid game, cheese, milk, shellfish, particularly mussels, and certain poisonous fish (such as crayfish, land crab, gray snapper, dolphin, etc.). The treatment of food poisoning, from whatever cause, is prompt evacuation of the stomach, preferably by the stomach tube, using plenty of water, and administration of tannic or gallic acid or strong tea. See PTOMAINES; MUSHROOM.

NEUROTIC POISONS. These act principally through the nervous system, and as a rule produce little or no tissue change.

Alcohol may act as an acute or chronic poison. Its effects are fully considered under INTOXICATION.

Opium and its chief alkaloid *morphine*, laudanum, Majendie's solution (of morphine), and paregoric are often used for suicidal or homicidal purposes. Paregoric particularly is responsible for many cases of opium poisoning in children, being a common ingredient of soothing syrups. Acute opium poisoning is characterized by a short preliminary stage of pleasurable excitement followed by drowsiness, sleep, and complete unconsciousness. In a moderately advanced case, the pupils are contracted to a pin-point, the respirations are slow, the pulse full, the skin moist. The breathing grows slower and slower until death supervenes from respiratory paralysis. The stomach must be promptly emptied, and tannic acid or potassium permanganate given as antidote. Stupor is combated by the administration of strong coffee, atropine, or strychnine, and by cold douches, flecking with wet towels, electrical stimulation, and later by forced artificial respiration. Chronic opium poisoning is seen in those habituated to the drug, both in Eastern and Western countries. See OPIUM.

Cocaine (q.v.) is extensively used as a local anæsthetic, and alarming symptoms have followed its absorption by the mucous membrane, or its hypodermic injection. Death occurs very rapidly (forty seconds to four minutes), with great depression and respiratory or cardiac failure. If the patient can be kept alive for half an hour, recovery is almost certain. If the poison has been taken by the mouth, evacuate the stomach, and in any case fresh air, artificial respiration, and stimulants are called for.

Chloral is quite often injudiciously used by the public to induce sleep and quiet the nerves; it is also taken with suicidal intent and given by criminals (knock-out drops) to induce prolonged stupor, often with fatal results. The patient simply passes into a deep sleep without previous excitement, and death occurs from heart failure. Treatment is like that of opium and cocaine. See CHLORAL.

Belladonna and its alkaloid *atropine* produce, when taken in poisonous amounts, dilatation of the pupil, flushing of the skin, dryness of the mouth, delirium, and sometimes convulsions. Recovery is the rule, but when death occurs it is from paralysis of the heart. Treatment consists in washing out the stomach and opium is the physiological antidote. Similar in their effects and treatment to belladonna are homatropine, hyoscyamus (henbane). hyoscyamine, hyoscine, stramonium, and dulcamara.

Strychnine and *nux vomica*. Strychnine is contained in certain vermin-killers, and is used both for suicide and murder. In poisonous doses it acts principally on the spinal cord, producing cramps and convulsions like those of tetanus (q.v.). Death or recovery is usually speedy. The patient is to be put in a quiet dark room, and tannic acid or charcoal is given, followed by stomach-washing. This must be done before spasms set in. Chloroform and ether control the convulsions, and the bromides and opium act in the same way, but more slowly.

Prussic acid and the various cyanogen compounds, contained in cyanide of potash, cherry-laurel water, bitter almonds, cherry, peach, and plum pits, are exceedingly rapid and fatal poisons. When smaller doses have been taken sulphate of iron may be given as an antidote and affusions and douches of cold water, and a resort to artificial respiration are the most useful measures. See HYDROCYANIC ACID.

Among other substances in the class which are occasionally taken in poisonous doses are aconite, cannabis indica, curare (arrow poison), digitalis, hemlock, and the various coal-tar products, such as acetanilid, phenacetine, and sulphonal (qq.v.).

Anæsthetics (ether, chloroform, and nitrous oxide) act as narcotic poisons when taken in overdose. The symptoms may be divided into two stages, one of excitement with rapid pulse and respiration, struggling and flushed face; and one of depression, in which the muscles are relaxed, the patient is insensible, passes into coma and dies from cardiac or respiratory failure. When dangerous symptoms come on during the administration of an anæsthetic this is to be stopped, the tongue drawn forward, the patient exposed to a current of fresh air or oxygen, and if breathing stops subjected to artificial respiration. Hypodermic injections of atropine or strychnine are also given. The inhalation or drinking of ether and chloroform is indulged in as a habit by a few individuals. See ANÆSTHETIC.

GASEOUS POISONS. The more common of these are carbonic acid gas, carbon monoxide, hydrogen sulphide, sulphurous oxide, illuminating gas, sewer gas and cesspool emanations, and carbonic acid gas (choke-damp) as found in the air of mines, cellars, and wells. Miners are frequently killed by the latter. Carbon monoxide occurs in charcoal fumes, fuel gas, and illuminating gas, and passes into the air of a room from defective flues or pipes. Air containing 1 per cent. of this gas is rapidly fatal. When exposure to this poison has been long and unconsciousness exists, recovery is not probable. The effects of illuminating gas are similar to those of carbonic oxide. Sewer gas is a mixture of sulphureted hydrogen, ammonium sulphide, nitrogen, and carbonic acid gas. The symptoms of the gaseous poisons depend on the amount absorbed and vary from slight headache and dizziness to suffocation and collapse. The treatment is to get the patient into the fresh air, give oxygen, or perform artificial respiration, and stimulate.

ANIMAL POISONS. The stings of insects, the bites of scorpions, tarantulas, snakes, and rabid dogs, are comprised in this group. Their action is complicated. The local effects are irritation, redness, swelling, and œdema, or even gangrene. The poison after entering the circulation may disorganize the blood, causing jaundice, hæmoglobinuria, hemorrhage into the tissues, and cyanosis. There are in addition general symptoms, such as vertigo, dyspnœa, prostration, cardiac paralysis, and finally collapse. The local treatment of such bites consists in the application of a tight band or ligature above the wound to prevent absorption; the destruction by the knife or cautery of the area containing the poison after removing as much as possible by suction; and the administration of stimulants such as ammonia, alcohol, or strychnine, to keep up the strength until the poison is eliminated. Quite recently a serum known as antivenene has been given in snake-bites with excellent results. See GLANDERS; HYDROPHOBIA; SERUM THERAPY.

The medico-legal duties of the medical examiner in cases of fatal poisoning, whether suicidal or homicidal, are: (1) to establish the presence or absence of conditions characteristic of any poison; (2) to preserve all necessary material for subsequent analytical examination, and to avoid introducing possible causes of error; (3) to recognize or exclude natural causes of death; (4) to perform experiments on animals, if necessary, in order to demonstrate the toxic effect of the substance separated by the chemical; and (5) to record carefully all observations and state clearly the conclusions as to the cause of death. Difficult cases constantly arise in which the post-mortem appearances are not decisive, or are consistent either with disease or poison. In performing an autopsy for medico-legal purposes, the identity of the body must first be established and the autopsy should be done in the presence of witnesses. The organs and tissues to be removed and preserved for future analysis are deposited separately in clear glass jars, which are sealed. The tissues and organs to be removed are the stomach, and intestines ligated and unopened; the entire liver; the blood from the heart and vessels; both kidneys; the urine; the entire brain; a large piece of muscle from the thigh; and portions of the bone and spleen. Important information as to the time of absorption is evidenced by the distribution of poison in the various tissues. The unabsorbed residue is found in the stomach and intestines. Poisons in both stomach and liver indicate a short interval between the taking and death; while poison in the liver and other organs, with none in the stomach, indicates a greater interval. Most poisons remain in the liver after disappearing from the stomach and remain longer in the muscles and bones than in any other tissue. Poisons are found in their greatest purity in the kidneys and urine. Proof of poisoning has been established by chemists by analysis of muscles or one kidney, when all the other tissues have been destroyed by the suspected parties. Besides the examination for poisons and their lesions, every organ must be examined for all natural causes of death, and in particular the causes of sudden death should be rigidly excluded. Consult: Witthaus and Becker, *Medical Jurisprudence, Forensic Medicine, and Toxicology* (New York, 1894); *Peterson, Legal Medicine and Toxicology* (Philadelphia, 1903); Brundage, *A Manual of Toxicology* (New York, 1901). See AUTOPSY; MEDICAL JURISPRUDENCE.

TOXIN. A specific bacterial poison whose absorption into the body causes an infectious disease. Though formerly used, as suggested by Brieger, to designate the poison members of the ptomaine group (see PTOMAINES) of bacterial bases, it was fortunately not so restricted. Toxins are not albumins; they are not proteid bodies. It had been surmised that the symptoms present during diseases induced by microörganisms were due to the basic poisons known as ptomaines. But after using in experiments these bases, it was learned that this was untrue. The ptomaines are not as potent as certain chemical products of the bacteria. Moreover, in the highly poisonous cultures of certain germs no ptomaines have been formed. This statement is true of diphtheria, as confirmed by Lœffler, Roux and Yersin, Brieger and Fränkel. Some of these investigators established the additional fact that the toxins are formed by synthetical processes, and not by splitting up the constituents of the culture medium or those of the animal body. The germ apparently constructs its toxin out of the components of a harmless menstruum. In several specific infectious diseases special toxins have been isolated. Marmier extracted a specific toxin from glycerin-peptone cultures of the anthrax bacillus, which does not give the reactions of albuminoid substances nor change starch, sugar, or glycogen. Animals immune to anthrax bacillus are immune to this toxin. Alkaline hypochlorites, as well as prolonged isolation in the presence of air, destroys its efficacy. Animals may be immunized to anthrax if treated with carefully graduated doses of this toxin. This toxin is contained in the bacterial cells of anthrax and the culture must be so adapted that opportunity is offered for it to diffuse from the cells. Similarly, the presence of a toxin derived from the comma bacillus has been demonstrated in Asiatic cholera, as also a toxin in tetanus, diphtheria, typhoid fever, and tuberculosis, while in suppuration the poisoning is due to toxin derived from the bacillus staphylococcus. Susotoxin has been isolated in hog cholera, and the toxin mulleïn or morvin is contained in the cell of the glanders bacterium. See ANTITOXIN; BACTERIA; IMMUNITY; and SERUM THERAPY.

TOXODONTIA, tŏk′sô-dŏn′shĭ-ȧ (Neo-Lat. nom. pl., from Gk. *τόξον*, *toxon*, bow + *ὀδούς*, *odous*, tooth). An extinct suborder of ungulate mammals found fossil in the Tertiary deposits of Argentina and Patagonia, South America. Toxodon was a heavily built animal as large as a rhinoceros, with a large heavy head placed on a short neck which sloped down from the shoulders, so that the head was much lower than the back. The teeth are large, compressed laterally, and either triangular or prismatic in section, and they grew from persistent pulps. The bones of the skeleton are all massive, the legs short and thick, and the feet are three-toed. Nesodon, an earlier genus than Toxodon, was of smaller size and less robust build.

TOXOPH′ILUS. A work in two books on archery by Roger Ascham (q.v.), in the form of conversations between Philologus and Toxophilus on the attractions of books and archery (q.v.).

TOY, CRAWFORD HOWELL (1836—). A distinguished American Oriental scholar. He was born in Norfolk, Va., and graduated at the University of Virginia in 1856. He studied at Berlin in 1866-68, became professor of Hebrew at the Southern Baptist Theological Seminary in 1869, and professor of Hebrew and Oriental languages and lecturer on biblical literature at Harvard in 1879. His publications include a translation and revision of Erdmann's commentary on Samuel in Lange's series (1877); an edition of Murray's *Origin of the Psalms* (1880); *The Religion of Israel* (1882; 3d ed. 1884); *Quotations from the Old Testament in the New Testament* (1884); *Judaism and Christianity, a Sketch of the Progress of Thought from Old Testament to New Testament* (1890); the Book of Ezekiel in the *Polychrome Bible* (Hebrew text, 1896; English, 1898); and the Book of Proverbs in the *International Critical Commentary* (1899).

TOYAMA, tō′yä′mȧ. The capital of the Prefecture of Toyama, in Japan, situated in the central part of Hondo, near the western coast (Map: Japan, E 5). The old castle is used as a school. There are manufactures of leather. Population, in 1898, 59,558.

TOYN′BEE, ARNOLD (1852-83). A pioneer of the Social Settlement movement. He was educated at Balliol College, Oxford, and afterwards became a tutor and lecturer there. He was the author of a number of well-known addresses on political economy, but is best known by his efforts to understand the economic and social problems of the working classes of Whitechapel, among whom he made his home, associating himself with the religious work carried on there by his friend S. A. Barnett. Early in life Toynbee had come under the influence of Ruskin, but his sympathy with the artisan class found a means of expression entirely his own. His favorite maxim, "The welfare of the producer is as much a matter of interest to the consumer as the price of the product," voiced the religion of the student of social conditions. His name is associated with the modern Social Settlement (q.v.). Two years after his death in the crowded Whitechapel district, which had been the scene of his efforts, Toynbee Hall was erected by the men of Oxford and Cambridge who had shared his labors there.

TOYNBEE, PAGET (1855—). An English philologian, distinguished for his studies in French and Italian literature, a brother of Arnold Toynbee. He was born at Wimbledon, near London. He was educated at Haileybury College, Hertfordshire, and at Balliol College, Oxford, and then became a private tutor (1878-92). He is especially known as a Dante scholar. His works comprise mainly *Specimens of Old French* (ninth to fifteenth century), (1892); *Index of Proper Names in the Works of Dante* (1894, 2d ed. 1897); *Historical French Grammar*, which is a skillful revision and amplification of Brachet (1896); *A Dictionary of Proper Names and Notable Matters in the Works of Dante* (1898); *Ricerche e Note Dantesche* (1899); *Critical Text of the "Divina Commedia"* (1899); *Life of Dante* (1900, revised 1901); and *Dante Studies and Researches* (London and New York, 1902). The "Dante Dictionary" is perhaps the most valuable commentary to Dante.

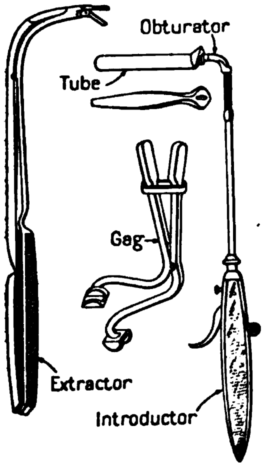
TOYOHASHI, tō′yô-hä′shē. A town in the Prefecture of Aichi, Central Hondo, Japan, 45 miles by rail southeast of Nagoya (Map: Japan, E 6). Population, in 1898, 21,785.

TRACERY (from *trace*, OF. *tracer*, *trasser*, Fr. *tracer*, to trace, track, delineate, from ML. **tractiare*, frequentative of Lat. *trahere*, to draw, drag). A term used of the kind of architectural detail that is connected with pierced or open ornamentation of any member or unit such as a window, arcade, or gallery. It was developed in windows and then extended to almost every part of ecclesiastical structures during the Gothic period. Technically there may be said to be stray examples of simple tracery at an earlier date, as in the case of pierced marble slabs in windows or screens, but tracery as an art and a system sprang up with the fully developed Gothic style in the first decades of the thirteenth century in France, when the whole wall space over the aisles in church interiors was devoted to enormous windows, one in each bay. (See WINDOW.) The general frame of each window inclosed those of several separate lights, and above and between their arched summits were minor foiled openings. The mullions, the cusps, the quatrefoil, and other openings formed what is termed the tracery of the windows, which became more elaborate in the succeeding centuries, seeking ever more complex geometric combinations of lines. The straight lines gradually were replaced in large part by curved lines. The rose or wheel windows, such as those of Notre Dame, in Paris, and the cathedrals of Rheims and Amiens, illustrate the various stages of this development. This tracery spread gradually from the windows until it overran almost every part of the church with its delicate lace patterns, sometimes on a solid ground, sometimes pierced. The earlier plate tracery had at once given way to the molded tracery. The period of a Gothic structure can generally be judged with tolerable accuracy by the style of its tracery. This is particularly the case in England, where two of the three main divisions of the Gothic movement, the Decorated and the Perpendicular, are so called on account of their styles of tracery, which give the key-note to each, and by means of which the merging of one style into the other can be traced. During the Decorated period the tracery became more varied in form, being composed of squares, triangles, and other forms, filled with foils and having the appearance of being packed together. This kind of tracery is called 'geometric.' The windows of the transition from Decorated to Perpendicular had tracery of a more flowing character, while that of the Perpendicular (q.v.) period became almost entirely composed of vertical lines. The flamboyant (q.v.) or contemporary style in France had tracery of a very different description, being as free and graceful as the other was straight and stiff. See Gothic Art.

TRACHEA (Neo-Lat., from Lat. *trachia*, from Gk. *τραχεῖα*, *tracheia*, trachea, windpipe, rough artery, so called because of the rings of gristle, from *τραχύς*, *trachys*, rough), or Windpipe. The tube through which air-breathing vertebrates receive air into the lungs. It extends from the throat to the bifurcation of the bronchi. It is sufficiently described in the article Respiration. Tracheotomy (q.v.) is necessary for the removal of foreign bodies lodged in the trachea and bronchi. The trachea shares certain inflammations and morbid processes in common with the larynx and the bronchi. For figure of trachea, see Bronchus.

TRACHEID. Usually elongated, taper-pointed, woody cells, resembling tracheæ in appearance, but not forming a continuous vessel. The wood of many conifers consists almost exclusively of tracheids. See Histology.

TRACHEOTOMY (from Gk. *τραχεῖα*, *tracheia*, trachea, windpipe, rough artery + *τομή*, *tomē*, a cutting, from *τέμνειν*, *temnein*, to cut) and Laryngotomy (from Gk. *λάρυγξ*, *larynx*, larynx + *τομή*, *tomē*, a cutting). Opening the trachea by incision in order to admit the entrance of air when suffocation is threatened. Among the conditions which demand tracheotomy are foreign bodies in the air passages, cut throat, diphtheria, œdema of the glottis, and tumors either within the larynx or pressing upon the air passages from without (as a goitre). The air passages may be opened in three different situations—namely, through the crico-thyroid membrane (see Larynx), when the operation is termed laryngotomy; through the cricoid cartilage and the upper rings of the trachea, the operation being known as laryngo-tracheotomy; and through the trachea, below the isthmus of the thyroid gland, constituting tracheotomy proper. Laryngotomy and tracheotomy are more commonly performed than laryngo-tracheotomy, to which no further allusion is required. Laryngotomy is more quickly and easily performed, especially in adult males, and is less dangerous; tracheotomy is a more difficult, tedious, and dangerous operation, but must be employed in some cases (as, for example, where there is any necessity for introducing the forceps and in cases where a tracheotomy tube must be allowed to remain in position for some time). The incision is made in the middle line of the neck, longitudinally, the blood vessels being pushed aside as much as possible with the handle of the knife. When the trachea is exposed and is cut through the wound is held apart with tenacula that the tube may be inserted. As haste is generally necessary, a neat dissection can rarely be made, but great care must be exercised to prevent blood from entering the air passage. When the operation is completed a large curved tube to breathe through is inserted in the aperture, and secured round the neck with tapes.



INSTRUMENTS FOR INTUBATION.

A double tube or canula possesses many advantages, as, by withdrawing the inner one, which should slightly project at its lower extremity, it may be cleared of any mucus or blood that may have accumulated in it, without disturbing the wound. The calibre of the inner tube should always be sufficiently large to admit as much air as usually passes through the chink of the healthy glottis. If left too long, the patient may die of asphyxia. It is therefore necessary to decide and act quickly, selecting a field of operation certainly below the point of obstruction, and a full-sized tube should be inserted. Up to the time of O'Dwyer the operation of tracheotomy was frequently and successfully performed. In 1885 Dr. Joseph O'Dwyer of New York devised instruments wherewith intubation of the larynx was performed as a substitute for tracheotomy. Intubation consists in placing a short tube in position in the larynx, between the vocal cords, its lower end reaching a point as low as an incision would be made if the air passages were opened, and thus admitting air from the throat. The tube may crowd down false membrane ahead of it, and in some such cases tracheotomy may be necessary. Few other dangers are possible. The tube may be removed on the fourth day, or may remain *in situ* till the eleventh day. Its presence causes disintegration of the pseudo-membrane of diphtheria; prevents reflex spasm; and also obviates the granulations which are common and very annoying after tracheotomy. If ulceration be produced by intubation it is superficial and trivial. The recoveries from diphtheria in cases in which intubation is practical average over 50 per cent.

TRACHINLÆ, trā-kĭn'ĭ-ē (Lat. nom. pl., from Gk. Τ*ραχίνιαι*, women of Trachis). A tragedy by Sophocles describing the death of Hercules, caused by the poisoned coat of Nessus, sent to him by Deianira, in jealousy of the captured Iole. The play takes its name from the chorus composed of women of Trachis, where Deianira is awaiting the return of her husband.

TRACHOMA, trȧ-kō'mȧ. A disease of the conjunctiva. See Conjunctivitis, section on *Granular Conjunctivitis*.

TRACHYTE, trā'kīt *or* trăk'īt (from Gk. *τραχύτης*, *trachytēs*, roughness, from *τραχύς*, *trachys*, rough). An igneous rock of porphyritic texture, often possessing also flow (rhyolitic) or vesicular textures. It generally exhibits porphyritic crystals of alkali feldspar, with which is usually associated also biotite, hornblende, or augite. The average composition of trachyte is: Silica, 64 per cent.; alumina, 18 per cent.; oxide of iron, 4 per cent.; magnesia, 1 per cent.; oxide of lime, 2 per cent.; oxide of sodium, 5 per cent.; oxide of potassium, 6 per cent. In composition trachyte differs but little from syenite.

TRACTARIANS. A popular nickname given, in the early days of the Oxford Movement (q.v.), to the party led by Newman, Pusey and Keble, from the *Tracts for the Times*, written by these and other members of the party.

TRACTION ENGINE. See AUTOMOBILE.

TRACTORS, METALLIC. See PERKINS, ELISHA.

TRACT SOCIETIES (Lat. *tractus*, treatment, discussion, handling, drawing, from *trahere*, to draw, drag). The word tract signifies a brief treatise. In the modern use of the term, it is applied almost exclusively to treatises upon religious subjects, and a tract is distinguished from a book mainly by its external (pamphlet) form and its brevity. The earliest illustration of a tract is found in the separate books of the Bible, each one of which, as originally circulated in manuscript form from hand to hand, may be considered a tract. Apart from this, however, we may consider Wiclif, the great English reformer, as the first to begin the work of writing and distributing tracts, which, though laboriously produced by hand, yet obtained a large circulation. With the invention of printing, the possibilities for the development of tract literature were wonderfully enlarged, and the religious movement which culminated in the Reformation may be said to mark the commencement of the general dissemination of Christian literature in tract form.

The availability of tracts as a means for propagating Christian knowledge led to the formation of societies for that express purpose. An early pioneer among tract societies for English-speaking peoples was the *Society for Promoting Christian Knowledge*, which was organized in England in 1698 and incorporated in 1701 to circulate Bibles and religious tracts both at home and abroad. The publication of tracts, begun by John Wesley in 1742, was soon carried forward upon a large scale, and in 1782 he organized the *Society for the Distribution of Tracts Among the Poor*. The first interdenominational union of Christian effort for the circulation of tract literature was effected in 1750, in the City of London, by the formation of the *Society for Promoting Religious Knowledge Among the Poor*. This was followed by the organization of similar societies in other cities, and though none of these maintained a permanent existence, they must be regarded as forerunners of the great tract societies of modern times. In the closing decade of the eighteenth century, at Bath, England, Hannah More (q.v.) initiated a movement for the better circulation of Christian literature by putting forth a series of short religious tales in tract form, named the *Cheap Repository*. In 1795 the *Religious Tract Society of Scotland* (now known as the *Religious Tract and Book Society*) was founded in Edinburgh, by Rev. John Campbell. This was followed, in 1799, by the organization of the *Religious Tract Society of London*, which stands foremost in age and influence among tract societies of the present day.

In America the work of religious publication was begun by the *Methodist Book Concern*, which issued its first publication in 1789. The *Massachusetts Society for Promoting Christian Knowledge*, founded in 1803, may be properly regarded as the first interdenominational organization for tract work in America. This was followed by the formation of various local societies, among which were the *New York Religious Tract Society*, organized in 1812, and the *New England Tract Society*, organized at Andover in 1814. The latter society, in 1823, changed its headquarters to Boston, and its name to the *American Tract Society*, and two years later became merged in the *American Tract Society* which was organized in New York City by friends of tract work, who desired to see a society of national scope and influence. Since that time tract societies have multiplied, but the American Tract Society still remains the principal agency for tract distribution in America.

A board of managers, consisting of a president, vice-president, and thirty-six members, are elected annually by this society. This board elects the publishing, distributing, and finance committees. The members of these three committees constitute an executive committee to conduct the business of the society. To promote in the highest degree the objects of the society, the Constitution specifies that the officers and managers shall be elected from different denominations of Christians; that the publishing committee shall contain no two members from the same ecclesiastical connection; and that no tract shall be published to which any member of that committee shall object.

Some idea of the magnitude of the work of this society may be gained from the following statistics. The whole number of distinct publications (not including periodicals) issued by the society from the home office from 1825 to 1903 was 8,498, of which 2,138 have been volumes and 6,360 tracts, etc. These have been published in a score of different languages. The total number of volumes issued during the previous seventy-eight years is 32,743,752; of tracts, 449,554,252; and of periodicals, 264,278,668; making a grand total of 746,576,672 copies of publications printed. Six periodicals are published by the society, viz. the *American Messenger, Apples of Gold, Light and Life, Deutscher Volksfreund, Amerikanischer Botschafter*, and *Manzanas de Oro*. The society has made appropriations amounting to $747,213, by the aid of which 5080 publications have been issued at foreign mission stations in 157 languages and dialects.

The constitution of the Religious Tract Society of London is similar to that of the American Tract Society. Its affairs are conducted by a committee, composed of an equal proportion of members of the Church of England and of Protestant dissenters. During its one hundred and four years the society has printed books and tracts in 250 different languages. In all the society has published over ten thousand books, tracts, etc., and its total distribution amounts to about 3,540,000,000 copies of its publications.

In New York and many other cities there are city mission and tract societies, which find the printed page a valuable auxiliary in reaching the 'submerged tenth.' Many of the evangelical denominations have their own boards of publication or publishing societies, which employ tract literature, especially in aid of their Sunday-school work. In Great Britain, in addition to the Religious Tract Society, there are several other tract societies, such as the *Monthly Tract Society* and the *Stirling Tract Enterprise.* On the Continent of Europe there are perhaps a score of societies which are engaged more or less in the publication and circulation of tract literature. Among the most important of these are the *Paris Tract Society* (*Société des Traites Religieux*), the *Toulouse Religious Book and Tract Society,* the *Geneva Evangelical Society,* the *Italian Evangelical Publication Society of Florence,* and the *German Evangelical Book and Tract Society.* In India, China, Japan, and other heathen lands there are a large number of tract societies which aim to provide Christian literature in the native languages. According to the *Centennial Survey of Foreign Missions,* by James S. Dennis (New York, 1902), there are a total of 159 missionary publishing houses and printing presses in such lands. The annual issues from these amount to 10,800,927 copies. There are also 379 magazines and papers published under missionary auspices, and these have a combined circulation of 250,809 copies.

BIBLIOGRAPHY. The literature on the subject of tract societies consists chiefly of the annual reports, pamphlets, etc., published by the various societies themselves. *The Story of the Religious Tract Society for One Hundred Years,* by Rev. S. G. Green, D.D. (London, 1899), was prepared by an editorial secretary of the Religious Tract Society of London, and is an authoritative history of that society. *The American Tract Society—An Historical Sketch* (New York, 1900), though but a brief pamphlet, presents the salient points concerning the history of the American Tract Society. *The Report of the Ecumenical Conference of Foreign Missions, New York, 1900* (New York and London, 1900), gives some interesting facts with reference to this subject.

TRACY, trȧ'sē', ALEXANDRE DE PRONVILLE, Marquis de (1603-70). A French soldier and administrator. After serving in several wars, he was appointed lieutenant-general of the French possessions in North America on November 19, 1663, and reached Quebec June 30, 1665, accompanied by many young nobles and 200 soldiers. In 1666 with 1,300 men he led an expedition against the Mohawks, burned several of their towns, and forced them to sue for peace. This expedition greatly alarmed Governor Richard Nicolls (q.v.), of New York, who attempted in vain to secure the aid of the New England colonies for an expedition against the French. Soon after this expedition Tracy returned to France.

TRACY, ANTOINE LOUIS CLAUDE DESTUTT, Count de. A French philosopher. See DESTUTT DE TRACY.

TRA'CY, BENJAMIN FRANKLIN (1830—). An American lawyer and Cabinet officer, born at Owego, N. Y. He was educated at Owego Academy, and was admitted to the bar in 1851. In 1853 he was elected on the Whig ticket as district attorney of Tioga County, and in 1856 was reëlected. In 1861 he was elected to the State Assembly on the Union ticket. In 1862 he recruited the 109th and 137th New York Volunteers and became colonel of the former. Failing health compelled him to relinquish his command, but within a year he again entered the army as colonel of the 127th United States regiment of negro troops. Subsequently he commanded the prison camp at Elmira, and at the close of hostilities was brevetted brigadier-general of volunteers. From 1866 to 1873 he was United States District Attorney for the Eastern District of New York, and from 1881 to 1883 was associate judge of the State Court of Appeals. In March, 1889, he entered President Harrison's Cabinet as Secretary of the Navy. In 1893 he resumed his law practice in New York, and in 1897 was the unsuccessful Republican candidate for Mayor of New York City, being defeated by R. A. Van Wyck. In 1899 he was counsel for Venezuela before the Anglo-Venezuelan Boundary Arbitration Commission.

TRADE ASSOCIATIONS. Associations of men engaged in manufacture or trade, for the furtherance or protection of their mutual interests. In England these associations antedate the nineteenth century. In the United States some were founded before 1850; by 1890 they had been formed in most well-established industries; while during the last decade of the century they had spread to almost every subdivision of the industrial world. In general, the trade association may include one or more of three classes of functions, the commercial, the industrial, and the protective. Associations to do the work of business agencies display most clearly the commercial function. The London Association of Guardians for the Protection of Trade was established as far back as 1776. The operation of the earlier societies was confined chiefly to the compilations of registers of bankruptcies, insolvencies, and private settlements with creditors. Societies may undertake investigations into the circumstances connected with a bankruptcy, and perform the general agency business of their members. More recently added features are in connection with credit. Although large commercial concerns furnish general information, there is still room for developing information bureaus within some trades. Many establishments have special credit men, who have formed a national association, with branches in thirty-five chief cities of the United States.

The general industrial functions of trade associations include first, the surveillance of important influences, such as legislation or railway rates, which affect the entire trade. With many associations the tariff question is a weighty and permanent issue, while laws affecting labor, the quality, the method of sale, or the inspection of goods (as in brewing or boiler-making), are constantly watched, advocated, or contested. In the second place, associations may seek to establish agreement in business methods to keep their members informed of new inventions or processes, of market conditions, and so on. A natural result of this activity is the publication of a trade journal, of which the Bulletin of the National Association of Wool Manufacturers (formed in 1864) is a well-known example. Various special functions, also, are often assumed. Thus provision may be made for exhibits at fairs, trade schools may be encouraged, selling agencies established, bureaus of employment maintained, local improvements furthered, or, as in the lumber business, a system of mutual insurance may be attempted. A very important function is the promotion of social intercourse and general good will. It is not always easy to draw a sharp line between the acts of a trade association and those of a trade combination in which the financial management has been centralized. At present the typical forms of protection are: (1) against introduction of so-called unfair methods within the trade; (2) against railroad discrimination in rates; and (3) against labor organizations. Jobbers' and retailers' associations protest against sales direct from manufacturer to consumer, and sometimes establish a boycott against recalcitrant manufacturers. The decreasing importance of the jobber in the distributive system makes the efforts of their associations of particular interest. 'Exclusive agreements' may be made by a middlemen's association with certain manufacturers, in which case no other but the latter's goods will be used. The object of certain associations, in their own words, is "to help the manufacturer decide who are legitimate dealers."

In trades where freight forms an important item of cost, a prime object of the association is likely to be the adjustment of railroad rates. The National Association of Stove Manufacturers and the National Transportation Association, an organization of shippers, are examples. In 1903 the Georgia Sawmill Association took the radical move of disregarding the possibility of an appeal to the Interstate Commerce Commission and themselves asked for an injunction restraining certain Southern railroads from advancing rates on yellow pine. They asked that the Southern Freight Association be declared an illegal combination in restraint of trade. Increased demands of labor organizations, in recent years, have greatly stimulated defensive action by trade associations. In the building trades of New York, the Employers' Association was engaged during 1903 in a bitter war with the unions, while in Chicago employers and employees of the same group of industries apparently passed the stage of fighting, and settled trade matters by agreement between their respective associations, a procedure not always to the advantage of the public.

TRADE, Board of. A department of government in England designated "the lords of the committee of his Majesty's Privy Council appointed for the consideration of all matters relating to trade and foreign plantations." Cromwell in 1655 was the first to establish a permanent committee for matters of trade. Charles II. continued the policy and in 1660 created two separate councils for trade and for foreign plantations, which in 1672 were consolidated into one. In 1786 the present department was established as a permanent committee of the Privy Council. The Board as now constituted consists of a president who is a member of the Cabinet, together with the First Lord of the Treasury, the Chancellor of the Exchequer, and numerous other ex-officio members; but, like the Treasury Board, the Board of Trade does not meet, and consists in practice of the president and his staff. It comprises the following departments: (1) The commercial, labor, and statistical department, whose principal function is the collection and dissemination of information concerning matters of trade. Since 1886 it has published the *Board of Trade Journal.* (2) The railway department, established in 1840, with numerous duties of supervision and inspection. (3) The marine department, established in 1850, which has general supervision over merchant shipping and the care of seamen. (4) The harbor department, whose province includes besides lighthouses, harbors, etc., weights and measures, coinage, and other miscellaneous matters. (5) The finance department, which keeps the accounts for the Board and audits for Parliament the reports of the life insurance companies. (6) The fisheries department.

TRADEMARK. A mark, name, emblem, or device adopted by a tradesman or manufacturer and attached to or stamped upon his goods in some manner for the purposes of identification by the public, and protection against the sale of fraudulent imitations. The law of trademarks is of modern development. In 1742 Lord Hardwick declared that he could not protect a trademark adopted by a trader from being used by another. It was not until 1803 that the English courts attempted to prevent the fraudulent use of an adopted trademark. Since that time the law on the subject has developed rapidly. The statute now in force in England is known as the 'Merchandise Marks Act.' It provides for registration, and makes the registry conclusive evidence of title after five years' use of the registered trademark.

The first trademark statute in the United States was passed in 1870. Under the decisions of the United States courts, the office of a trademark is to indicate the origin or ownership of an article on which it is found. Therefore, it follows that a valid trademark must fulfill one of the above essentials either from its own nature or by reason of association with the article itself and the maker's name. A name which is merely descriptive of the qualities or nature of an article, cannot constitute a valid trademark, as its use as such might tend to create a perpetual monopoly in the sale of the article described. For example, the United States courts held that the words 'acid phosphate' could not be protected as a trademark, as they were considered to be descriptive of the essential characteristics of the preparation sold under that name, and as it was a known form of chemical combination, it would prevent others from describing accurately a similar combination.

In general, a geographical name cannot be used as an exclusive trademark. However, a person not doing business in a locality known for a certain product will not be permitted to use the name of that locality as a trademark on similar products handled by him, but not coming from that locality where the name is already in use by a tradesman in the well-known district. A person's own name will not be protected as a trademark as against a person of the same name, who, acting in good faith, desires to use his name on his own goods. A trade name is, therefore, to be distinguished from a trademark, and can only be protected by a court of equity where some one attempts to deceive the public and take another person's trade by adopting his trade name. A close imitation of a trademark may amount to an infringement, especially if there are other circumstances tending to show that there is an intention to deceive the public and take advantage of the business reputation of another.

Any one who handles goods may impress his trademark upon them, and be protected in its use, if he has exercised any peculiar skill or judgment in their selection, care, or alteration. The right to an exclusive trademark may be lost by abandonment, but the evidence of the intention to discontinue using it must be very clear. A trademark is not generally considered to be property in the sense that it can be taken under an execution, but it may be transferred from one person to another, unless it is of such a nature that to allow it to be used on the goods of a person other than the one who originally adopted and used it would tend to deceive the public. The sale of a business, good will, etc., usually includes the trademarks under which goods were sold by the owners. For the law in the United States, see Browne, *Law of Trademarks* (Boston, 1885); for the English law, Sebastian, *Law of Trademarks* (London, 1890); Barclay, *Law of France Relating to Trademarks* (2d ed., London, 1899). See also Copyright; Patent.

TRADE-NAME. A name under which a person or corporation does business and which by user becomes so associated with the good will of the business as to be valuable. A *trade*-name is to be distinguished from a *trade*-mark which is affixed to or impressed on merchandise, and when registered is protected by statute. The wrongful user of an established trade-name will be restrained by a court of equity on the ground that it constitutes fraud and deceit against the public and an unlawful appropriation of something which is so closely allied to the business of another as to be a species of property right. A trade-name may sometimes be registered as a trademark, and this fact is the source of the confusion resulting from the use of these terms as being interchangeable. The statutes of most States prohibit one corporation from adopting the same name as another and the Secretary of State should be consulted before a name is adopted for a new corporation. Consult *Browne, on Trademarks* (2d ed. 1898); also article Trademarks.

TRAD'ESCANT, John (c.1570-c.1637). A traveler, naturalist, and gardener, said to have been born in Holland. He is thought to have made a voyage to Northern Russia in 1618, and in 1620 served against the Algerine pirates. Afterwards he was in the service of the Duke of Buckingham, and after the Duke's assassination seems to have become royal gardener. About this time he established a physic garden and museum at South Lambeth, and was the first Englishman "who made any considerable collection of the subjects of natural history." His son John (1608-62), born at Meapham, Kent, added largely to his father's collection, and in 1637 visited Virginia, where he gathered "all varieties of flowers, plants, shells, etc." In 1656 he published his *Museum Tradescantianum: or a Collection of Rarities, Preserved at South Lambeth, Near London.* Upon his death in 1662 the museum went by the terms of his will to Elias Ashmole, and in 1682 became the nucleus of the Ashmolean Museum at Oxford.

TRADE SCHOOLS. See Technical Education.

TRADES UNION CONGRESS. A British federation of trade unions, organized in 1868, which has met annually since that date except in 1871. At the time of its formation the British unions were engaged in an earnest struggle for favorable legislation, and the congress played an important part in securing the legislative victories of 1871-75. (See Trade Unions.) Since that time it has confined itself largely to the tasks of creating a favorable public opinion, voicing the demands of organized labor, providing a place for common meeting, and securing favorable labor legislation. The last function is exercised largely through a permanent Parliamentary committee, the expenses of which are paid by a per capita tax upon the affiliated unions of £1 10s. per 1000 members. The Parliamentary secretary devotes all his time to the work and receives a salary of £250 per annum. The congress itself is thus a deliberative body merely, but in recent years it has started two auxiliary federations—the Labor Representation Committee (q.v.) and the General Federation of Trade Unions. (See Trade Unions, The General Federation of.) At the thirty-fifth congress, held in London in 1902, 198 societies, with 1,400,000 members, were represented. The total income for the year was £2,010.

TRADE UNIONS. "The term 'national trade union,'" says the Federal statute providing for the incorporation of trade unions, "in the meaning of this act shall signify any association of working people having two or more branches in the States or Territories of the United States for the purpose of aiding its members to become more skillful and efficient workers, the promotion of their general intelligence, the elevation of their character, the regulation of their wages and their hours and conditions of labor, the protection of their individual rights in the prosecution of their trade or trades, the raising of funds for the benefit of the sick, disabled, or unemployed members, or the families of deceased members, or for such other object or objects for which working people may lawfully combine, having in view their mutual protection or benefit." No definition less complete than the above is sufficient fully to indicate the complex character of the trade union, since the trade union has always been an insurance association and a social and educational club, as well as "a continuous association of wage-earners for the purpose of maintaining or improving the conditions of their employment," as Beatrice and Sidney Webb define it.

History. The connection between the modern trade union and the journeymen clubs of the Middle Ages is a matter of dispute. Throughout the later Middle Ages, and with comparative frequency after the fourteenth century, traces are encountered of journeymen clubs—the German *Schenken*, the French *confréries de compagnons*—which maintained a more or less continuous existence, regulated apprenticeship, paid friendly benefits, and engaged in protracted conflicts with employers, characterized by the essential element of the modern strike. Admitting, as Professor Ashley suggests, that the journeymen of these fraternities "were almost all unmarried, that when employed they lived in the master's house, that the masters themselves had usually been journeymen, that the number of masters and journeymen was very much the same," there nevertheless seems to the writer no tenable reason for denying to these associations all the essential attributes of the modern trade union. It is evident, however, that effective and solid trade unionism is intimately dependent upon the existence of a body of workers who will in the natural order of things remain wage-earners throughout their lives. In other words, the trade union follows in general the permanent separation of the employing and wage-earning classes. This separation, speaking generally, was a product of the industrial revolution and the factory system. Trade unions consequently did not become numerous until the latter half of the eighteenth century.

In England the history of trade unionism in the eighteenth century is marked by increasing hostility on the part of Parliament toward combinations of laborers. Laws regulating wages, apprenticeship, movement of laborers from parish to parish etc., existed, and the open activity of the trade unions during that century seems to have been largely directed toward the enforcement of those laws, which the employers themselves at times found it convenient to break. Laws against combinations of workingmen in specific trades began to multiply as the doctrine of *laissez-faire* secured wider acceptance. These laws culminated in the Combination Acts of 1799 and 1800, by which every form of combination, whether of employer or employees, was rigidly prohibited. In effect, the acts were enforced against the laborers only. For twenty-five years the unions were driven into hiding, but they were by no means extirpated. In 1824 the whole group of combination laws was repealed, but in the following year a reaction set in, and in another statute the law against combination was revived, leaving laborers free to combine, however, for the purpose of fixing the wages or hours of labor of parties to the combination.

The act of 1825 was followed by the rise of labor organizations or general trade unions of a socialistic nature described in the article on LABOR ORGANIZATIONS. During these years, however, the trade union proper was making steady progress within the separate trades, in which identity of interests made unity of organization and policy a comparatively easy task. Toward the middle of the century a reaction against the strike set in, and widespread reforms in the management of the friendly benefit system were inaugurated. The union which applied the new ideas most successfully was the Journeymen Steam Engine and Machine Makers' and Millwrights' Friendly Society, which in 1850 absorbed several other large unions of mechanics and became the Amalgamated Society of Engineers, whose careful and elaborate set of rules for the financial and general administration of the union served, according to Mr. and Mrs. Webb, as the "model for all national societies" founded between 1852 and 1889. The reaction from the socialistic trade unionism of the '30's brought to the front a remarkable group of labor leaders, acute, tactful, industrious, and conservative, who between 1860 and 1875 united in a persistent and energetic campaign for legislative reform. The first victory came in the Master and Servant Act of 1867, which corrected the most glaring defects of the old law on this subject. The union leaders, however, aimed at more sweeping concessions. By the celebrated Trade Union Act of 1871 it was provided that no trade union should be deemed illegal simply because it was in restraint of trade, and unions were given a legal standing carrying with it protection of their funds, without exposing them to the ordinary obligations of an incorporated company. Finally in 1875 the unions secured the passage of a very liberal Employers' and Workmen's Act (replacing the Master and Servant Act of 1867), and a revolutionary Conspiracy and Protection of Property Act, which expressly permitted peaceable picketing, and provided that no combination to do any act in furtherance of a trade dispute between employers and workmen should be indictable as a conspiracy unless such act if committed by one person would be punishable as a crime.

In 1860 a giant stride toward collective bargaining was taken by the formation in the hosiery trade of the first joint conference between employers and employees for the peaceable settlement of trade disputes. The federation of trade unions began; trade councils became common in the cities, and in 1868 the first national Trades Union Congress was held at Manchester. Finally the successful legislation of 1871, like that of 1824, was followed by a tremendous expansion of trade unionism and the reappearance of many of the phenomena which had marked the epoch of labor organizations in the '30's, with their ideal of an aggressive, militant organization, free from the incumbrance of friendly benefits, embracing working women and unskilled labor, participating actively in politics, and with tendencies toward socialism.

The most noteworthy event of late years is the formation in 1899 and 1900 respectively of the General Federation of Trade Unions (see TRADE UNIONS, THE GENERAL FEDERATION OF) and the Labor Representation Committee (q.v.). Between 1892 and 1901 inclusive the aggregate membership of British trade unions grew from 1,503,298 to 1,922,780, constituting, according to the latest official estimates, about 20 per cent. of the working classes from which trade unions recruit their membership, or 25 per cent. if we exclude the agricultural classes.

In the United States there is no positive record of a trade union before 1803, the year in which the New York Society of Journeymen Shipwrights was incorporated. In 1806 a union of the House Carpenters of the City of New York was organized, and the first union of the Journeymen Tailors is said to have been organized in the same year. As early as 1817 the New York Typographical Society had been in active existence for some time, and in 1822 the Charitable Society of Shipwrights and Calkers of Boston and Charlestown was formed.

The most important events of the period from 1825 to 1850 are briefly described in the article on LABOR ORGANIZATIONS. For a time trade unionism seems to have become involved in the cause of general reform; wide-reaching and ambitious federations were formed which worked at the same time for the abolition of slavery, for woman's rights, land nationalization, and coöperation, as well as the improvement of the conditions of employment. During this period trade unionism proper was undoubtedly making progress in the separate trades, and by 1840 in the principal industrial centres local unions had been organized among the masons, marble-cutters, shoemakers, saddlers, hatters, tailors, printers, bricklayers, roofers, painters, carpenters, and shipworkers.

The fifteen years between 1850 and 1865 may well be described as the *period of nationalization*. Labor leaders had learned that for a time at least the labor movement must go forward cautiously, that participation in politics and broad attempts to reform things in general were dangerous, that labor organizations must be extended, if at all, within trade lines, and not by all-embracing amalgamations. In 1850 the union now known as the International Typographical Union was organized. (See TYPOGRAPHICAL UNION OF NORTH AMERICA, THE INTERNATIONAL.) This was probably the first American national union, though there is some reason to believe that the Silk and Fur Hat Finishers' National Association was organized as early as 1843. The National Association of Hat Finishers of the United States of America was founded in 1854, the National Protective Association (the Locomotive Engineers) in 1855, the Sons of Vulcan and the National Spinners' Association in 1858.

Since the Civil War local and national unions have been organized on every hand, their government has been perfected, and their administration improved. A large number of vigorous labor journals have appeared; labor parties have been formed and in places have succeeded in electing labor candidates; permanent boards of collective bargaining or arbitration and conciliation have been formed in many trades; boycotting through the union label and labor press has been systematized and developed; favorable legislation has been secured in every State; and, more important than any other result, perhaps, public opinion has been brought to concede the utility and even the necessity of the trade union. The most striking phenomenon of the epoch has been the formation of large federations of unions. Among these larger organizations may be named the National Labor Union (1866), the Knights of Labor (1869), the International Association of Workingmen (1864), the Industrial Brotherhood (1873), the American Federation of Labor (1881), the National Building Trades Council (1897), and the American Labor Union (1898). By far the most important of these is the American Federation of Labor. (See LABOR, AMERICAN FEDERATION OF.) The growth and striking success of this organization supply a potent lesson in the requirements and conditions of successful labor organization. Avoiding direct participation in politics, and sedulously refraining from compulsory interference in the immediate affairs of its constituent unions, it confines itself to the prosecution of those aims which all labor organizations have in common, namely, the organization of new unions, the passage of legislation favorable to the working classes, the wider use of the union label, and the support of the labor press.

STATISTICS OF TRADE UNIONS IN THE UNITED STATES. These are collected by the Labor Bureaus of a few States, but no complete enumeration for the whole country has ever been made. Estimates of the aggregate membership of American unions vary widely. In January, 1903, President Gompers of the American Federation of Labor estimated that about two and one-half millions of the seventeen million wage-earners in the United States were organized. The estimate is probably too high. The report of the Industrial Commission gives the estimated membership of labor organizations in the United States on July 1, 1901, at 1,400,000. This is probably the most reliable estimate ever made. The increase during 1902 was very great. The unions affiliated with the American Federation alone reported an increase of 283,827 members during the eleven months, November 1, 1901-September 30, 1902. Assuming that the estimate furnished by the Industrial Commission is correct, the aggregate membership of labor organizations in the United States, at the close of 1902, was about 1,650,000. The average membership of the American Federation of Labor alone, during the year ending September 30, 1903, was 1,465,800.

A more satisfactory idea of the growth of trade unions may be gained from the following table, in which the total membership of unions in Great Britain and New York is given, and an estimate of the members represented in the annual convention of the American Federation of Labor.

NUMBER AND MEMBERSHIP OF LABOR ORGANIZATIONS

YEAR	New York State		Represented in conventions of American Federation of Labor		Great Britain	
	Organizations	Membership	Organizations	Membership	Organizations	Membership
1890	....	....	83	199,500	....	....
1891	....	....	52	199,100	....	....
1892	....	....	68	228,400	1,192	1,503,298
1893	....	....	72	245,900	1,240	1,480,291
1894	860	157,197	56	176,300	1,279	1,437,025
1895	927	180,231	75	207,100	1,299	1,408,486
1896	962	170,296	92	273,500	1,314	1,495,476
1897	1,009	168,454	75	265,800	1,306	1,613,753
1898	1,087	171,067	110	279,000	1,277	1,649,461
1899	1,320	209,020	158	350,400	1,270	1,803,897
1900	1,635	245,381	181	550,300	1,252	1,910,614
1901	1,881	276,141	221	789,500	1,236	1,922,780
1902	2,229	329,098	226	1,025,300	....	....

The latter estimate is secured by allowing 100 members for each delegate to the convention. The figures for 1890-95 inclusive are taken from the report of the Industrial Commission and are based upon the actual number of delegates at the conventions. The figures for 1896-1902 are based upon the estimate made by the secretary of the American Federation of the number of delegates *entitled* to sit in the conventions, published in the Proceedings of the 22d Annual Convention of the Federation. To avoid duplication, the members of city centrals and State branches have been excluded. The real membership of the unions affiliated with the Federation is undoubtedly much greater than the paid-up membership indicated in the table, owing to the common custom of paying the per capita tax, on which the representation is based, upon a part only of the actual membership.

TRADE UNIONS AND THE LAW. The development of the law in the United States has been different from that in England. A few early cases are recorded in which trade unions were declared illegal, but as early as 1821 in Pennsylvania and 1842 in Massachusetts a view diametrically opposite to the English law was taken, and since has been consistently maintained by American courts, except in so far as it has been modified in very recent years by the anti-trust acts. Workmen may combine to improve the conditions of their employment and agree not to work for less than a certain amount, or to refuse to work for employers paying less than this amount, without active interference from the legal authorities; and in several important cases the courts have gone to the point of recognizing the legality of the by-laws of unions and even of enforcing them (*Master Stevedores' Association v. Walsh*, 2 Daly, 1; *People v. Musical Mutual Protective Union*, 118 N. Y. 101). Our legislatures have gone even further than the courts in recognizing the legality of the purposes of trade unions. The Federal Government and many of the largest States have enacted statutes providing for the incorporation of trade unions under exceptionally favorable conditions. But only an unappreciable percentage of unions have taken advantage of the incorporation laws, and labor leaders are practically unanimous in opposing it, on the ground that it would subject the unions to an indefinite number of vexatious and costly suits at law. The State legislatures have also conferred several special privileges upon labor organizations. Massachusetts and Kansas, for instance, have exempted labor organizations from the operation of the statutes regulating fraternal beneficiary associations; and about fifteen of our largest States have passed statutes prohibiting employers from discharging workmen for joining labor organizations, and even from making it a condition of employment that they should not belong to such organizations. Finally, at least two States and many local legislative bodies have enacted laws providing, directly or indirectly, that certain public work—usually printing—shall be performed only by union labor. Within recent years the legal status of trade unions has been seriously affected, at least in theory, by the so-called antitrust acts passed by Congress and many State legislatures, making contracts or combinations in restraint of trade or commerce illegal. The Federal statute, which is concerned, of course, only with inter-State trade and commerce, has been held to apply to a labor organization of draymen and longshoremen (*U. S. v. Workingmen's Amalgamated Council*, 54 F. R., 994); and the same interpretation will probably be given to the State statutes save where they are specifically labor organizations. Little or no attempt has been made to dissolve unions or punish their officers under anti-trust statutes, but where these laws apply the legality of the most reputable unions is seriously threatened.

TRADE UNIONS IN OTHER COUNTRIES. While probably the germs of labor organizations in almost every country of Continental Europe may be found in earlier and even in mediæval organizations and movements, they owe their present strength, spirit, and methods chiefly to the socialistic propaganda; most of them have remained in close connection with the Social Democratic parties, and many of them—particularly in France, Belgium, Italy, and the Scandinavian countries—are as much political clubs as trade unions. (See SOCIALISM.) There are, however, a number of strict trade unions on the Continent—particularly among the printers—and this number is continually increasing. As the Continental labor union grows older and more powerful, it manifests a stronger disinclination to be treated as a mere appendage of a political party. The Continental union was late in developing. The year 1864, which marks the formation of the International Workingmen's Association (see INTERNATIONALE), furnishes a substantially accurate date for the beginning of the trade union movement on the Continent.

The political character of Continental unionism has decreased its efficiency by dividing the forces of labor into several semi-hostile groups. In Germany, for instance, we find the labor organizations divided into three distinct classes: A group of 'peace' unions, known as the *Hirsch-Dunckersche Gewerkvereine*, with 88,279 members (in 1898), assert the essential harmony of interests between employers and employees and depend upon arbitration and friendly benefits rather than strikes for the improvement of the conditions of employment. Clearly distinguished from the former by their aggressive methods in general are the socialistic *Gewerkschaften*, which in turn are divided into two groups over the question of direct participation in politics: the unions federated under the Central Commission (with 493,742 members) advocating a separation of the labor and the socialistic movements, and the local organizations (with 17,500 members approximately) opposed to this separation. The *Christian Unions*, with 161,517 members, constitute a third class distinct from and opposed to the preceding groups by their anti-socialistic principles. In Belgium the labor organizations are practically dominated by the political parties. In France the factional quarrels of the socialists have been carried into the labor organizations, with the consequence that in almost every city the trades are grouped into several hostile unions whose antagonism makes unity of action almost impossible. In Australia, on the other hand, where according to some authorities as many as 75 per cent. of the male workingmen belong to trade unions, and where the unions have secured a large proportion of their victories by political action, socialism has made little headway.

With the view of giving some idea of the beginning and extent of labor organization in the various Continental countries, the following tabular statement has been prepared. It is almost impossible to distinguish the labor organizations from the political clubs and fraternal associations in many countries, so that the figures must be interpreted as rough estimates of the extent of labor organization in the several countries rather than exact statistical measurements.

COUNTRY	Beginning of the modern movement	Approximate membership of labor organizations		Remarks
		Date	Number	
Netherlands	1811	1894	52,818	Freedom of combination was granted in 1811; the movement was, however, weak until very recently.
Belgium	1840	1900	100,000	Constituting from 10% to 11% of the laboring population from which unionists are drawn.
Switzerland	1858	1900	50,000	This estimate is a very loose one.
France	1874	1900	588,832	In addition there were 533,454 persons in agricultural associations and 29,044 members of mixed associations of employers and employees.
Germany	1865	1899	864,350	In addition, about 620,000 members of organizations exercising some of the functions of a trade union. In 1901 the membership of the socialistic trade unions alone was 688,870.
Austria	1867	1901	150,000	119,050 in the general federation of socialistic "Gewerkschaften."
Denmark	1871	1900	96,295	It is reliably estimated that 76 per cent. of the male and 21 per cent. of the female industrial population over 18 years of age belong to trade unions.
Norway	1871	1899	24,000	This estimate is a very loose one.
Sweden	1883	1898	50,000	This estimate is a very loose one.

CLASSIFICATION OF TRADE UNIONS. As was pointed out in the article on LABOR ORGANIZATIONS, the trade union is simply one branch of the great family of labor organizations. The following classification brings out clearly the great diversity of structure which exists both among organizations of laborers and among trade unions themselves:

- LABOR ORGANIZATIONS
  - Continuous
    - Not on the trade principle
      - Political,[*] e.g. Independent Labor Party.
      - Fraternal,[*] e.g. Ancient Order of United Workmen.
      - Mixed assemblies, e.g. Knights of Labor.
      - Industrial unions, e.g. United Mine Workers.
      - General amalgamations, e.g. Knights of Labor.
    - On the trade principle
      - Non-federative
        - Sub-locals, e.g. Printers' chapels.
        - Local unions, e.g. "Big Six" of New York.
        - District councils, e.g. of Carpenters and Joiners.
        - National unions, e g. Iron Molders' Union.
        - International unions, e.g. Cigar Makers' International Union of America.
      - Federative
        - Central unions, e.g. Chicago Federation of Labor.
        - State federations, e.g. Massachusetts Federation of Labor.
        - Industrial federations, e.g. National Building Trades Council.
        - General federations, e.g. American Federation of Labor.
  - Temporary
    - Strike.
    - Boycott.

[*] These are not strictly labor organizations, but are included here because their membership is drawn almost exclusively from the ranks of labor.

The preceding classification emphasizes the difference between amalgamated labor unions and trade unions or federations in which the individuality of each trade is preserved. The 'mixed assembly' is simply the governmental unit of the amalgamated union. It was a permanent feature of the Knights of Labor, but it is also used by the Federation of Labor, and is known as the 'federal union.' It supplies a union for workmen in unorganized trades, or in places where there are not enough workers in one organized trade to start a local union. The industrial union is merely a centralized union, in which are united all the workers of any one industry, irrespective of trade or occupation. The United Mine Workers, for instance, aim to coalesce in the same local union all wage-earners "working in and about the mines except mine manager and top boss." There are also industrial unions which do not aim to unite all classes of workmen in the same locals, but which attempt to unite local unions of the different trades in a single national body. The latter are to be regarded as federations of trade unions, rather than labor organizations. The 'central' or 'central union' is merely another name for the municipal federation of trade unions.

GOVERNMENT. The government of local unions is distinguished by its thoroughgoing democracy. The tenure of office is usually six months and there is a widespread feeling in favor of rotation in office. The most important local officers are the business agent or walking delegate and the chairman of the grievance committee. Only a small proportion of the locals have such officers, but where they do there is a strong tendency to reëlect men who have proved themselves the possessors of the unusual abilities which these positions require. The government of the national union usually comprehends a periodical convention, a permanent executive board, a corps of organizers, a president, several vice-presidents, and a secretary-treasurer. As the referendum is apparently becoming more and more popular in

America, the general membership must be counted in many unions as the ultimate source of legislative power, and, indeed, of the judicial and executive power, as well as in the numerous cases in which the general membership decides appeals, votes strikes and special assessments, etc. In unions which do not employ the referendum system, the supreme executive and judicial powers are vested in the periodical conventions and in the executive boards between conventions, but as these boards are usually composed of unsalaried workmen living in different cities and conducting their deliberations by mail, it frequently—perhaps usually—happens that their powers are virtually exercised by the president, who and the vice-president and secretary-treasurer almost invariably have seats in the executive board.

Problems of Organization. The great difficulties of labor organizations show themselves in bitter disputes between unions. In the first place, there are disputes between dual unions. This is a simple trade war between rival unions which openly claim control of the same trade and the same field. Secondly, jurisdiction disputes are likely to arise. These disputes may be divided into several classes according to the cause and nature of the conflict. (a) Territorial disputes. A typical instance is noted in the 24th Annual Report of the Bureau of Statistics of New Jersey. Here the work on a large building was seriously interrupted for months by a quarrel between the New York and Newark local unions of the International Brotherhood of Electrical Workers, the New York union claiming exclusive right to all work in Newark in accordance with an agreement made with the international union. The dispute was finally settled by an agreement, in accordance with which the Newark union was given "one-half the jobs which a New York contractor may have to dispose of on a building in Newark, the Newarkers to have the New York rate of wages." (b) Demarcation disputes are those arising from conflicting claims to certain work lying midway between two distinct trades. The shipbuilding industries on the Tyne, for instance, were tied up for eighteen months or more at one time by demarcation disputes which hinged largely about the "limit of the size of the iron pipes to be fitted by the engineers and the plumbers respectively, and whether the joiners should or should not be confined to woodwork of one and one-half inches thickness." (c) The third class of disputes consists of those arising between a more extensive and a less extensive union, concerning the autonomy of the latter. Thus the increased division of labor in the printing trade made of the pressmen a separate class, and new inventions produced the stereotyper and electrotyper. It was inevitable that these classes should desire their trade independence, and that the original union should strenuously oppose all secessions likely to decrease its power and prestige. And in fact there has been a long series of conflicts between the old Typographical Union and bodies of discontented pressmen, bookbinders, stereotypers and electrotypers. (d) Industrial organization versus trade autonomy. A similar but far more important source of jurisdiction disputes is the rapidly growing practice of adapting labor organization to industrial organization, and uniting in one union all the trades represented in a single industry. Industrial organization inevitably brings the union adopting it into conflict with the unions of the separate trades represented in the industry. Thus the United Mine Workers have had serious conflicts with the stationary firemen and the blacksmiths, and the brewery workers have been in constant strife with the painters and coopers, the team drivers, etc. This conflict takes its importance from the fact that both methods of organization are characterized by marked advantages as well as defects. In the strike and in all phases of collective bargaining, industrial organization is obviously superior, both for the employer and for the employees. On the other hand, the subordination of a minority of skilled workers to a larger number of less skilled craftsmen is frequently a source of weakness and always a source of dissatisfaction.

The Ultimate Form of Organization. One of the most persistently advocated remedies for jurisdiction disputes has been that of amalgamation, the form of organization in which all the trades are coalesced in a strong central union. Amalgamation has never proved practicable. United action is plainly necessary, but it must be secured by federation and not by consolidation. Another remedy for the jurisdiction dispute, tried with only partial success, is the 'jurisdiction statement.' The constitution of the National Building Trades Council, for example, provides that "all organizations affiliated with any local Building Trades Council shall plainly and satisfactorily define the class of work they claim, and no trade will be permitted to do the work pertaining to another." Up to the present time, however, the jurisdiction statement has been of but little use in preventing conflicts between unions. The indications are strong that the ultimate structure of union organization will be exceedingly complex; that the unit of government will be the simple trade union of the old type, but that these unions will be combined in a very large number of cross-cutting federations, each distinct and independent, but all of them formed, as it were, of the same material. The simple trade union will probably retain jurisdiction over such questions as industrial education, apprenticeship, and friendly benefits. On the other hand, the regulation of the strike and the settlement of demarcation disputes will in all probability come within the province of industrial federations, which are even now multiplying rapidly. The industrial federations have come to stay. Yet there will undoubtedly be additional federations. The broad, general federation represented at present by the American Federation of Labor will surely persist, devoting itself particularly, as the Federation does, to education of the working classes, the rapid extension of labor organization, the promotion of favorable legislation, the defeat of unfavorable legislation, the wider use of the boycott, and the maintenance of a labor press. It is probable that the time is almost ripe for political action by labor organizations. But past experience teaches unequivocally that almost without exception the entrance of trade unions as such into politics has proved disastrous. Such being the case, it is probable that the trade union will enter politics by means of a distinct political federation. A striking example of this is the Labor Representation Committee (q.v.) of Great Britain.

METHODS AND POLICIES OF TRADE UNIONISM.

Trade Unionism and Monopoly. Probably no social institution in existence represents the movement away from the old economic policy of *laissez-faire* more concretely and forcibly than the trade union. Almost every method or policy adopted by the trade unions is in essence a regulation of competition. The essential function of the trade union is collective bargaining; and the first condition of successful collective bargaining on the part of the trade union is that it shall secure substantial control of the efficient supply of labor. In securing and maintaining such control two policies are adopted: a policy of inclusion and a policy of exclusion. To obtain control of a particular trade in a particular jurisdiction, the utmost effort will be made to bring into the union every effective competitor for the work to be done in that jurisdiction. Once having control, there is the strongest temptation, if not a real necessity, for limiting the supply of craftsmen by regulation of apprenticeship and other means. The great majority of trade unions prosecute the work of organization vigorously and incessantly. In the beginning trade unionism was sporadic and instinctive, and the national union was the product of the amalgamation of two or more self-organized locals. At present organization is deliberate, systematic, and proceeds from the top down; the local is the child rather than the parent of the national. Even the exclusive unions like the Window Glass Workers enter heartily into the work of organizing the great mass of unskilled workers, because with the increasing use of machinery this body constitutes a constant menace to all trades. The organization of wage-earners is the special work of the Federation of Labor. In 1902, for instance, the Federation employed fifteen salaried organizers, who gave their whole time to this work; 39 others who devoted from one to six months of their time to organization; and nearly 1,000 volunteer organizers who were paid for each new union organized by them. The expenditure for organization alone was over $36,000; and new charters were issued to 14 national and international unions, 6 State branches, 127 central unions, and 877 local trade and federal labor unions.

Restriction of Membership. In almost every American union the applicant for admission must be accepted by the local which he desires to enter, and in voting upon applicants a minority of the members—in some important unions as few as three blackballs—are usually sufficient to exclude the candidate. At present, however, in the majority of American unions, the terms of admission are purely nominal.

Entrance to a Trade. Trade union regulations concerning the entrance to a trade fall under four heads: apprenticeship, limitation of boy labor, progression within the trade, and the exclusion of women. The limitation of boy labor will be treated with the limitation of apprenticeship, while the regulation of promotion within a trade is not a question of great practical importance in American unions, except perhaps in the union of the Post Office Clerks, where for obvious reasons the regulation of promotion becomes the main object. The exclusion of women is no longer attempted by American or English unions, the only case to the contrary in the United States known to the writer being that of the Upholsterers' International Union of North America. Nevertheless, only a small proportion of the female bread-winners are organized. In Great Britain, for instance, in 1901, the women and girls constituted only 6.2 per cent. of the members of trade unions and were found in only 144 out of the 1,250 unions, though the census of occupations showed that the female bread-winners were nearly one-third as numerous as the males.

The Regulation of Apprenticeship and Boy Labor. The regulation of apprenticeship was not in origin a trade union policy; it was introduced, adopted, and sanctioned by statute law at a time when the trade union did not exist. Consequently, although the trade unions indorse the regulation of apprenticeship with striking unanimity, and still regard it as an ideal, such regulation is at present enforced only in an insignificant number of trades and seems to be disappearing. The apprentice system is much less prevalent in the United States than in Great Britain; and in the latter country in 1897 Mr. and Mrs. Webb estimated that out of the 1,490,000 members of the trade unions only 90,000 belonged to unions which were actually able to enforce apprentice regulations. The desirability and expediency of the regulation of apprenticeship by trade unions is extremely questionable. An examination of the apprenticeship regulations of the few American labor unions which are able to enforce them plainly shows that the educational motive is decidedly a minor one, while these regulations exercise no perceptible effect in checking child labor under any given set of conditions. On the other hand, the unions which have acquired sufficient power to regulate apprenticeship have evinced a strong disposition to restrict unduly the number of apprentices. A wide examination of the apprenticeship regulations of American unions shows that the average period of apprenticeship is more than three years and the average number of apprentices to journeymen somewhat less than one to ten. Finally—and this fact seems conclusive—the restriction of membership to workmen who have been apprenticed is not necessary to the successful operation of the union. The United Mine Workers, the Locomotive Engineers, the Carpenters and Joiners, and in fact most of the large unions, in practice if not in theory, are completely 'open.'

Monopolistic Alliances Between Trade Unions and Employers' Associations. The evil possibilities of the policy of exclusion are well illustrated in occasional compacts between trade unions and combinations of manufacturers in which the two organizations combine to monopolize a certain industry for the benefit of both. In the Birmingham (England) Metal Trades these 'alliances,' as they are called, were common about 1897-98. The essential feature of the Birmingham alliance was an agreement by which the employers bound themselves to employ none but union men, in return for which the latter agreed to work for no manufacturer who sold his product at prices less than those formally adopted by a 'wages board' composed of an equal number of employers and employees. For every advance in price there was to be a proportionate, though not an equal, advance in wages. Monopolistic alliances of this kind are rare and as a rule not lasting.

Regulation of Wages. The most essential function, as well as the explanation and justification of trade unionism, is the determination of the conditions of employment by collective instead of individual bargaining. The most important condition of employment is the rate of wages, as is well illustrated by the fact that, in both England and the United States more than 50 per cent. of the strikes which occur are caused by disputes about wages. The conditions and characteristics of the regulation of wages by trade unions may be briefly summed up under three heads. (1) The standard rate as maintained by American unions is a local rate fixed by the local union. In a few trades working largely by piece, such as the Potters, Glass Blowers, etc., the scale of prices is fixed for the whole country by the national union; and in a few other unions, such as the Brewery Workmen and the United Hatters of North America, a national minimum time rate is prescribed. But in the vast majority of unions the regulation of wages is left wholly to the local union, and no strong demand for uniformity seems to exist. (2) Contrary to general opinion, the majority of trade unions, in trades in which it is possible, favor work by the piece rate system. In England, Mr. and Mrs. Webb have made a careful study of the wage system of every trade union having more than 1,000 members, unskilled laborers and transport workers excepted. Of these, 111 unions, having 1,003,000 members, were examined; forty-nine, with 573,000 members, insisted on piece work; twenty-four, with 140,000 members, willingly recognized piece work; and thirty-eight, with 290,000 members, insisted on time work. A similar investigation in the United States was made by the Industrial Commission. Information was secured concerning 50 important unions in which piece work was possible. Of these unions 28 accepted the piece-work system in some department without active opposition, while 22 unions either forbade or actively discouraged piece work. The reasons for this diversity are clear. In some occupations, such as spinning and weaving, the intensity of the labor is determined by the speed of the machine, or, speaking generally, the employer finds it possible to set the pace for the employee. In such occupations it is evident that the workers will insist upon piece payment to prevent forcing and over-exertion. In other occupations, such as ordinary carpentering or repair work in general, it is impossible to estimate how much skill or time will be required to perform a given 'job' or piece, and here the time rate is the workman's only defense against exploitation. The testimony collected by the Industrial Commission amply proves that the majority of the labor leaders of the United States would abolish the piece-rate system instantly if it were possible. The leaders hold that under the piece-work system the most proficient workmen set the pace and fix the standard rate, thereby depressing the earnings of the less talented but no less industrious or deserving shopmate. In addition the argument is made that the piece-rate system either encourages excessive production, and thus depresses prices, or throws the work into the hands of a few workmen, thus increasing the amount of non-employment, both of which results tend strongly to reduce wages. The feeling is also prevalent that the piece system stimulates employees to over-exert themselves and to work themselves out at an early age.

It must be admitted that the piece system in practice may be, and often is, manipulated to the injury of the general body of wage-earners. It is undoubtedly true that employers are disposed to reduce piece rates as soon as the more efficient workmen in their employ demonstrate an ability to earn an unusually high rate by the system; and furthermore, the testimony seems convincing that in many instances the piece-rate system does lead over-ambitious employees to injure their health in the attempt to earn unusually high rates of pay; but the objection to piece work on the ground that it leads to over-production, and the defense of a uniform wage irrespective of productive power, are on the face of them evils and untenable, if not from the standpoint of the trade union, at least from the standpoint of the general public.

Hours of Labor. In the eyes of the American labor leaders the regulation of the hours of labor is an even more important function of the trade union than the regulation of wages, as the question of the working day is primarily one of health, morals, and the necessary leisure for education, and social and religious duties. In this respect the trade unions have from the beginning placed unusual reliance upon the law. But they have also worked incessantly to reduce the hours of labor by direct negotiations with employers, by strikes, and by boycotts.

The normal day, like the standard wage in the great majority of American unions, is left almost entirely to the separate locals, and even in the few nationals which have a maximum working day for the whole country the locals are left free to secure a shorter working day if possible. But although the locals are accorded a wide discretion in fixing the normal day, the national organizations and leaders constantly urge them to reduce the number of hours, and among the national organizations strong enough to lead in this matter, laws requiring increased rates for overtime, or wholly forbidding overtime except in cases of extreme emergency, are common.

Restriction of Output. The preceding section makes it plain that trade unions do restrict the industrial output openly and systematically. The restriction of the output of individual workers is accomplished in several ways: by adopting a normal day and discouraging or prohibiting overtime; by limiting the daily task or the earnings of piece-workers; by discouraging or prohibiting the grading of time-workers, and thus leveling wages; by forbidding piece work, time work, contract jobs, or the butty system; and in some cases by encouraging the go-easy system of secret loafing, or 'the adulteration of labor.'

A variety of arguments are brought forward in defense of the general policy of the limitation of output. Trade unions claim that this is the only way of preventing over-exertion on the part of workmen, particularly under the piece system; that it tends to prevent unemployment and moderates the destructive competition of the army of the unemployed; and finally that it tends to prevent over-production. There is a large degree of truth in all these contentions. The history of the factory system is one long proof of the truth that, under a régime of freedom of contract in the sale and purchase of labor, wage-earners are driven by the employers and led by the pace of the hardier workmen to impair the health both of themselves and their offspring. It is true also that increased leisure, wisely spent, tends to elevate the standard of life, and that wages are in a measure determined by the standard of life; that collective bargaining presupposes given rules based upon the average efficiency and endurance, thus restraining in its operation the strongest workmen from doing their utmost; that in periods of temporary depression distributive justice sanctions a limitation of the work and income of each, in order that all may have some work and some income.

No judgment upon this subject may, however, be rendered except in concrete cases. When the United Mine Workers demand an eight-hour day in underground mines, the justice of the demand seems unanswerable; when the Window Glass Workers insist on a four months' stop each year, the demand is questionable; but when the Chicago plumbers limit, as they did in 1889, the amount of work in some branches to about half as much as could be performed by an able-bodied workman without undue strain, the demand is *prima facie* inequitable.

The point is even clearer in the limitation of wages as distinct from the limitation of hours. That the Detroit Stove Founders should limit piece earnings per day to $4.50 may seem reasonable as a preventive of over-exertion; but that time-workers, like the stone-cutters, carpenters, and coopers, should oppose the payment of more than the standard rate to exceptionally efficient workers, or that the machinists should oppose a classification of their workmen by the War and Navy Departments, thus forcing all workmen to the dead level of the idlest and most incompetent, seems indefensible.

ATTITUDE TOWARD MACHINERY. Historically, trade unions have opposed the introduction of labor-saving machinery, but, speaking generally, the unions have realized at last that it is impossible effectively to oppose the introduction of labor-saving devices; and among trade union leaders the number of those who fully realize that the machine in the long run is the friend and ally of the wage-earning classes is rapidly increasing. Trade union leaders may be said in general to have learned how to meet successfully the industrial problems caused by the introduction of machinery. Thus, when the printers were confronted with a great decrease in the demand for labor as a result of the invention of the typesetting machine, the Typographical Union met the problem in a rational manner. It insisted that the operators of the machines should be selected from ordinary printers, and that they should be paid as much at least as the wages of the hand printers. For a short time large numbers of printers were thrown out of employment, but in three years, according to the estimate of the president of the Typographical Union, the increased demand for printers, consequent upon the decrease in the cost of printing, afforded work for more than the old supply of printers. The justice of trade union regulation respecting the use of machinery must in each case be decided in accordance with its intent. Trade unions are justified in the attempt, if not clothed with the duty, of lessening the hardships occasioned by the extensive introduction of revolutionary inventions. It is the permanent antagonism to labor-saving machinery which is both hopeless and economically fallacious.

TRADE UNION INSURANCE. Mutual insurance —aid to the traveling journeyman in search of work, assistance in case of sickness, and a collection to defray burial expenses—was perhaps the principal function of the trade union of the eighteenth century, and still constitutes a principal function of trade unionism in foreign countries, particularly in England. In the ten years 1892-1901, for instance, the 100 principal trade unions in England expended £299,310 in working and miscellaneous expenses, £293,552 in dispute or strike pay, and £919,901 in friendly benefits.

Among American unions, however, conditions are entirely different. Of the 96 national unions of which information is at hand, 22 make no provision for any kind of benefits, 32 pay no strike benefits, 48 pay no death or funeral benefits, 74 pay no sick or accident benefits, and 91 pay no unemployment or out of work benefits. Only 2 pay a superannuation benefit, and one of these is a branch of a British union.

While it is evident that the friendly benefit is not essential to the successful conduct of a trade union, it is also true that the leading American labor leaders strongly advise the institution of the benefit system, and in unions maintaining this system it has been of immense service in accumulating large reserve funds, in forcing obedience from members, in preventing them from dropping out when their interest wanes, and in stimulating a more conservative policy in general. The powerful Cigar Makers' International Union, for example, and the railroad brotherhoods, furnish illustrations of the advantages of the insurance system as an auxiliary to trade unionism. (See RAILWAY BROTHERHOODS.) The insurance function, however, is strictly subordinate, except in one or two organizations. The insurance funds are unprotected, and may be expended in strikes, trade wars, or for any purposes which meet the approval of the constituted authorities. After having paid insurance assessments for years, the individual member may be expelled for a trifling infraction of rules, or may see the insurance system abolished and all the funds dissipated in supporting a sympathetic strike. Nevertheless the individual members acquiesce in this condition of affairs, and vehemently oppose any attempt at regulative legislation. The widespread opposition of trade unions to incorporation rests largely upon the belief that it would destroy this unlimited freedom in the use of insurance funds.

COLLECTIVE BARGAINING, ARBITRATION, AND CONCILIATION. Modern political economy recognizes in collective bargaining a legitimate and the most important function of trade unionism. This concerted action, by which employers are prevented from fixing wages at the rate acceptable to the neediest competitor, is the goal and aim of trade unionism. The walking delegate, or business agent, who represents a body of union workmen, advises them what rate of wages to demand, and conducts their negotiations for them, is thus not an ugly incident, but an essential necessity of trade unionism—the very heart of the institution.

In England systematic collective bargaining by recurrent joint conferences was first introduced in the hosiery trade about 1860. At the present time Mr. and Mrs. Webb estimate "that in all skilled trades where men work in concert on the employer's premises 90 per cent. of the workmen find either their rate of wages or their hours of work and often many other details predetermined by a collective bargain in which they personally have taken no part, but in which their interests have been dealt with by representatives of their class." And in the United States the system has been introduced to an extent scarcely realized by the general public. Thousands of local agreements exist in the cities, particularly in the building industry; and in about a dozen trades national agreements exist. The history of trade arbitration and collective bargaining shows that the value of these agreements lies in the conciliatory spirit engendered by conferences in which employees and employers meet on a footing of friendly equality. The arbitrator or umpire, with decisive vote, is relatively unimportant. The reason for this statement lies in the important difference between the adoption of new contracts and the interpretation of existing contracts. The latter function is judicial in nature and may safely be left to authoritative arbiters. On the other hand, the adoption of new principles, or the determination of future conditions, is a matter of competitive struggle, which, except on extraordinary occasions, should not be left to outside parties, however disinterested. Recognizing this truth, trade union leaders generally oppose compulsory arbitration; and even in collective bargaining arbitration seems to be going out of favor both in England and the United States. In the printing (newspaper) and general foundry trades agreements for arbitration exist, but none of the national systems of collective bargaining in the United States contain a provision for arbitration in case the representatives of employers and employees fail to agree.

Collective bargaining is to a degree dependent upon the organization of employers, and it increases in extent and efficiency as employers' organizations increase. Associations of employers are not new, but in the last few years they have become not only more numerous than in the past, but more systematic and more thoroughly managed. (See Trade Associations.) Most of the existing manufacturers' associations, like the Stove Founders' National Defense Association and the National Association of Builders, encourage collective bargaining and thus make for industrial peace. A large majority of American unions officially indorse arbitration and conciliation. In Great Britain Mr. and Mrs. Webb think that the opposition to arbitration in the strict sense is steadily growing. In the United States opinion is divided, and it is impossible to say whether opposition is increasing or decreasing. It is, however, indisputable that the employees far more frequently invoke the aid of State boards of arbitration than the employers, and that they are practically undivided in support of collective bargaining on the one hand and in opposition to compulsory arbitration on the other hand.

The Strike. Trade union regulations respecting strikes (see Strikes and Lockouts) are so diverse that it is impossible to describe them in a few sentences. Generally speaking, the local union is the active agent in the strike; the national organizations in which a local may be forced to strike against its will number probably less than a dozen, and in only three or four may a local be expelled for striking against the decision of the national officers. The control of the locals is through the purse. Many of the unions maintain protective funds, or war chests, which in the well-managed organizations frequently assume very respectable proportions. If the local desires strike pay and other financial support it must refrain from striking except in accordance with the established regulations of the union. In the better organized unions a procedure of the following nature is imposed upon locals: Before the strike may be considered a local grievance committee, or the local president or business agent, must attempt to settle the grievance amicably with the employer in question. If these negotiations fail, the local may then vote upon the question of striking, and in this vote the ballot is usually secret, while in most unions a two-thirds vote is required to authorize the strike. If the local indorses the strike, the decision must be ratified by the national president or executive board, and at this point, again, most unions require the national president to proceed to the scene immediately and make every effort to adjust the grievance by peaceable negotiation with the employer. Only after the failure of this attempt may the national sanction be conferred upon the strike.

The effect of such regulations can be easily appreciated. The strike of the past was sporadic, passionate, and directed against some abuse which the workers believed intolerable. The strike of the present day is deliberately and systematically conducted; it marks the rising market and periods of prosperity; with many trade unions it has become a settled policy. It is not intended to suggest that trade unions encourage strikes; the general opinion of economic writers is to the contrary. What is meant is that the strike as conducted by the trade union is governed by interest and not by passion; and that "while the most intelligent and conservative labor leaders freely recognize the expensiveness of strikes and desire to supplant them as far as possible with peaceable methods of negotiation, they almost uniformly maintain that workingmen gain in the long run far more than they lose by the general policy of striking." For the statistics of strikes, see Strikes and Lockouts.

The Boycott. The American union has done with the boycott what it has done with the strike: made it less violent, but more deliberate and systematic. The old form of boycott —the fiery crusade for the social and commercial ostracism of the offending employer—is still met with occasionally, but the favorite method at present is to place the recalcitrant employer on an unfair list and spread the ban through the medium of the labor press. The initiative is largely taken by complaint of the local union to the national executive board that some employer is violating union rules. The national officers usually offer the employer a hearing at which to disprove the charges, or offer proof of intention to discontinue the objectionable practice, and if such proof is not supplied the offender is placed on the list of merchants or manufacturers with whom loyal trade unionists are encouraged to have no business dealings either as purchasers of commodities or sellers of labor. A majority of American unions use this system to a greater or lesser extent. The Federation of Labor gives national scope to the more important boycotts by indorsing them and including the offenders' names in the column of the *American Federationist.* Between 75 and 100 firms and companies were under boycott by the Federation in January, 1903. It is clear that if the 1,465,800 or more members of the Federation strictly observed every official boycott the latter would become a formidable weapon against manufacturers and sellers of commodities in general use among the laboring classes. The observance, however, is so lax that the boycott is not effective except in a few industries, such as the brewing industry, and in some union strongholds, such as Chicago, Milwaukee, and the larger cities generally.

Boycotts proper, however, have been generally held unlawful in American courts, though a few recent equivocal decisions are held by some to point the other way. American trade unionists, however, are practically unanimous in upholding the right to boycott. Their argument rests upon the absolute and complete legality of the act of discontinuing business relations. Finally, trade unions exert what is often called 'a legal boycott' through the familiar union label, which has played such an important part in the building up of the Cigarmakers', Garment workers,' and Hatters' unions in America, and the use of which is now spreading, not only among American unions, but among those of England, Germany, Austria, and Australia. See UNION LABEL.

BIBLIOGRAPHY. For the history of trade unionism in England, consult Webb, *History of Trade Unionism* (2d ed., London, 1896), containing an exhaustive bibliography; for the United States, Ely, *The Labor Movement in America* (New York, 1886); for statistics in England, see *Annual Reports* by the Chief Labor Correspondent of the Board of Trade on Trade Unions; for statistics in the United States, 17th volume of the *Report of the Industrial Commission* (Washington, 1901); for legal aspects, Stimson, *Hand-Book to the Labor Law of the United States.* This is brought up to date in the fifth volume of the *Report of the Industrial Commission.* For the organization, functions, and policies of trade unions, see Webb, *Industrial Democracy* (London, 1902); for organization, functions, and policies of American trade unions, 17th and 19th volumes of the *Report of the Industrial Commission.* For materials and sources, England, *Report of the Royal Commission on Labor;* in particular, vols. ii., iii., and v.; United States, *Report of the Industrial Commission;* in particular, vols. v., vii., xii., xiv., xvi.

Most of the labor and statistical bureaus of the separate States now publish statistical and other material upon trade unions. Much of this information is fragmentary and untrustworthy, but the reader is especially referred to the *Reports of the Massachusetts Bureau of Statistics of Labor* and the *Annual Reports of the New York Bureau of Labor Statistics.* A notable source of current information is the bi-monthly bulletin of the Bureau of Labor. Almost all of the trade unions now publish monthly journals, among which the *American Federationist,* the *Typographical Journal,* and the *Locomotive Firemen's Magazine* are especially noteworthy.

TRADE UNIONS, THE GENERAL FEDERATION OF. The central labor organization of Great Britain. It was organized July 1, 1899, under the auspices of the British Trades Union Congress for the purposes of upholding "the rights of combination of labor," promoting industrial peace, and establishing a fund for mutual assistance and support. The Federation is "open to every *bona-fide* trade union in Great Britain," but the unit of membership is the trade union and "no branches or individuals are allowed to join." It is governed by a general council of delegates which meets annually, and between these sessions by a management committee of fifteen. Appeals may be taken from the decisions of both the council and the committee to the general membership. The Federation is "non-political and non-legislative," leaving to the Labor Representation Committee (q.v.) the campaign for the election of labor representatives to Parliament, and to the Parliament committee of the Trades Union Congress the agitation for favorable labor laws. The Federation pays, in strikes authorized by the general council or the management committee, two grades of strike benefits: five shillings a week per member "on the higher scale," and half this amount "on the lower scale." Unions on the higher scale contribute sixpence a member per quarter, and unions on the lower scale threepence a member per quarter, on ninety per cent. of the total membership, exclusive of superannuated members. In cases of emergency the management committee is authorized to increase the regular dues 100 per cent. The entrance fee is one penny per member upon ninety per cent. of the total membership, but in addition it is provided that "Any society desirous of joining the Federation shall pay ten per cent. of the average worth per member of the class or scale the union or society is joining, in addition to their entrance fee, but any society not in existence at the time of adoption of this scheme shall be allowed to join on payment of five per cent. of the average worth per member of the Federation at the time of joining." No union is entitled to benefits until it has belonged to the Federation for twelve months. The Federation started with 343,000 members. During the fiscal year ending June 30, 1902, the total income was £29,962 and the total expenditures £9,957, of which £8,338 was for strike benefits. At that date the reserve or defense fund amounted to £76,969 and the membership to 419,606.

TRADE WINDS. See WIND.

TRADING STAMPS. Slips of engraved or printed paper usually in the form of gummed stamps, which are given by merchants to purchasers of goods, and which may be presented to some person or corporation in exchange for articles of value. The trading-stamp companies usually agree to distribute books containing the names of their subscribers among the residents of the city and surrounding country. The scheme amounts to an advertisement and various forms of it are in operation in many States. The statutes of a number of States prohibit these 'gift enterprises' as being a form of lottery. In New York such a statute was held unconstitutional on the ground that there was no element of chance in the scheme, and that the prohibition was an interference with legitimate trade. The United States court took a contrary view in passing on an act of Congress prohibiting gift enterprises in the District of Columbia. The court held that the statute was a valid exercise of the police power, on the ground that the trading stamp scheme by which the enterprise was conducted was a burden on both the merchants and purchasers of their goods. The assumption is that a merchant who buys the trading stamps from some corporation introducing them will make up the amount he is thus compelled to pay either in the price of his goods or their quality, and thus in the end the public are deceived into thinking that they are obtaining something for nothing. An additional objection to the scheme advanced by the court was that the trading stamp companies profited by the fact that many persons did not present their stamps for the premiums offered. The decisions of the various States are not uniform on this question, the two views above presented illustrating the diversity of opinion. Where there is an element of chance as to the value of the article which a certain number of trading stamps may draw, the general view is that the scheme is akin to lottery, and illegal. See LOTTERY.

TRADUCIANISM (from Lat. *traducianus*, from *tradux*, vine-branch for propagation, from *traducere*, to lead along, train, propagate, from *trans*, across, through + *ducere*, to lead). One of the theories adopted for the purpose of explaining the production of the soul in the procreation of human species. It is ascribed to Tertullian (q.v.) as its first author, and is elaborately explained and defended by him in his book *On the Soul*, written after he had lapsed into the Montanist heresy. In opposition to others who had held the theory of preëxistence of souls, of which preëxisting souls one is divinely infused, or, by some natural affinity, is attracted into each fœtus as soon as it has been formed by generation in the procreation of man, Tertullian taught that souls are propagated by souls as bodies by bodies, and by the same or a simultaneous process. In another place he describes this origin of soul from soul as generation, and even of a class analogous to corporeal generation; and this more gross and material exposition of the theory of traducianism is sometimes called *generationism;* which, however, is commonly looked upon as a totally distinct theory. A third hypothesis to explain the origin of the soul is that of creationism (q.v.).

TRAETTA, trä-ĕt′tȧ, TOMMASO (1727-79). An Italian composer, born at Bitonto. He studied at the Conservatorio di Loreto, Naples (1738-48), and in 1751 produced his first opera, *Farnace*, in Naples. From 1765 to 1768 he was a director of a conservatory in Venice, and resigned to become Court composer to Catharine II. at Saint Petersburg. His most important operas were *Germondo* (1776) and *Ippolito ed Aricia* (1759), which gained for its composer a life pension from the King of Spain. His works were characterized by theatrical effectiveness and harmonic vigor. Consult Capruzzi, *Traetta e la musica* (Naples, 1878).

TRAFALGAR, trä′fȧl-gär′, *or, more commonly in England*, trȧ-făl′gẽr, CAPE. A low promontory on the south coast of Spain, about 29 miles northwest of Tarifa (q.v.), at the western entrance to the Strait of Gibraltar. It is memorable for the great naval victory obtained off its shores by the British fleet under Nelson over the combined fleets of France and Spain on October 21, 1805. The allies had thirty-three ships, commanded by the French vice-admiral, Villeneuve, while Nelson had twenty-seven. The British fleet was arranged in two columns. The first under Collingwood fell upon the rear of the allied fleet, commanded by the Spanish vice-admiral, Gravina. After a terrible contest, in which Nelson himself lost his life, the two British columns completely disorganized the hostile line. Eighteen ships were captured, and Napoleon's naval power was gone forever. For the important influence this victory had on the course of the Napoleonic wars, see NELSON, HORATIO; NAPOLEON I. Consult Mahan, *Influence of Sea Power on the French Revolution* (Boston, 1892).

TRAFALGAR SQUARE. A London square named in commemoration of the battle of Trafalgar and containing the imposing granite column in memory of Nelson, two fountains, and statues of Havelock, Napier, Gordon, and George IV. About it are the buildings of the National Gallery, National Portrait Gallery, Royal Humane Society, Royal College of Physicians, and other public buildings.

TRAFTON, MARK (1810-1901). A Methodist Episcopal minister, born in Bangor, Me. He joined the Maine Conference 1831, but held most of his charges in the New England and Providence Conferences. In 1852, while serving his third term as pastor at Westfield, he was elected to represent his district in the Thirty-fourth Congress. He was a poet of no mean order. He published *A Plea for Infant Baptism and Against Exclusive Immersion* (1846); *Rambles in Europe* (1852); *The Safe Investment* (1856); *Baptism, Subjects and Modes* (1870); *Scenes in My Life* (1877).

TRAGACANTH. See GUMS.

TRAGEDY. See DRAMA.

TRAGIC POET, HOUSE OF THE. One of the most attractive houses of Pompeii, made famous as the home of Glaucus in Bulwer's *Last Days of Pompeii*. The name was assigned through misconception of a painting discovered at the time of the excavation. It had two stories, and was richly decorated with paintings, among them the two best-known Pompeian paintings, "The Nuptials of Zeus and Hera" and "The Sending Away of Briseis," both preserved in the Naples Museum, together with the noted mosaic of a dog with the motto "Cave Canem," originally in the floor of the vestibule.

TRAGOPAN (Neo-Lat., from Gk. τραγός, *tragos*, goat + Πάν, *Pan*, Pan), or HORNED PHEASANT. One of the crested pheasants of the genus Ceriornis, which have naked cheeks, a horn-like caruncle projecting backward from behind each eye, and a loose wattle, capable of being inflated, hanging beneath the bill. Five species are known, all found in India and China.

TRAILL, trāl, Catherine Parr. A sister of Agnes Strickland (q.v.).

TRAILL, Henry Duff (1842-1900). An English journalist and author, born at Blackheath, near London. He was educated at the Merchant Taylors' School, London, and at Saint John's College, Oxford. In 1869 he was called to the bar at the Inner Temple, but he soon gave up law for journalism. He edited the *Observer* from 1889 to 1891, and was the projector and first editor of *Literature* (established 1897). Traill did much miscellaneous work of good quality. For the "English Men of Letters" series he wrote *Sterne* (1882) and *Coleridge* (1884); for "English Worthies," *Shaftesbury* (1886); for "English Statesmen," *William III.* (1888); and for "English Men of Action," *Strafford* (1889). Other biographies by him are *Lord Salisbury* (1891), *Sir John Franklin* (1896), and *Lord Cromer* (1897). In politics and history are *Central Government* (1881); the exhaustive *Social England* (1892-96), of which he was editor; *From Cairo to the Soudan Frontier* (1896); and *England, Egypt, and the Soudan* (posthumous, 1900). For prose literature may be cited *The New Lucian* (1884) and *The New Fiction and Other Essays* (1897). Political verse contributed to various periodicals was collected under the titles, *Recaptured Rhymes* (1882) and *Saturday Songs* (from *The Saturday Review,* 1890).

TRAIN, George Francis (1829-1904). An American author, born in Boston, Mass. After engaging in the mercantile business in Boston and Australia, he went to England in 1860, and undertook to form street-railway companies in Birkenhead and London, but his plans were obstructed by legal opposition. His publications include: *An American Merchant in Europe, Asia, and Australia* (1851); *Young America Abroad* (1857); *Irish Independency* (1865); and *Championship of Women* (1868). He also published an autobiography entitled *My Life in Many States and in Foreign Lands* (1902).

TRAIN BANDS. Early English militia raised by commissions of musters, and organized and drilled as military bodies. On the abolition of the fyrd in 1604, James I. organized in its place the *train bands* to the number of nearly 200,000 men. As an organization the train bands were neither militia nor volunteers, but partook of the nature of both, and in point of efficiency lacked both discipline and drill. During the Civil War they sided almost to a unit with the Parliamentarians, and rendered very effective service. After the Restoration, the command and control of the army was definitely assigned to the King; before this time the question had been in doubt. See Armies, section on *Great Britain;* Militia.

TRAINING. See Physical Training.

TRA'JAN (Marcus Ulpius Traianus) (a.d. 51-117). A Roman Emperor (a.d. 98-117). He was born at Italica, near Seville, in Spain. He was descended from a family which was probably of Roman origin, and was early trained to arms, becoming a leader in the Parthian and German campaigns, during the reigns of Titus and Domitian. He was rewarded for his services by promotion to the offices of prætor (a.d. 85) and consul (a.d. 91), and was adopted (a.d. 97) by Nerva (q.v.) as his colleague and successor. Trajan became sole ruler in January of the following year, and celebrated the event of his accession by largesses to the soldiers, and to Roman citizens and their children. He also made provision out of the Imperial treasury for the maintenance of the children of poor freemen in Rome and other Italian towns. In a.d. 101 Trajan set out on his first campaign against the Dacians, who had exacted tribute from Rome since Domitian's time. The struggle was long and destructive, but the Romans at last gained a decisive superiority, and in a subsequent campaign (104 to 105) completely subdued their opponents, whose country thenceforth became the Roman province of Dacia, and was secured by partial colonization. This conquest, the first since the death of Augustus, was celebrated, on Trajan's return to Rome, by a triumph, and by games on a most extensive scale, which continued for four months. The Column of Trajan was erected to commemorate this victory. In 106 Trajan again went to the east. Landing in Syria, he marched northward, receiving on his way the submission of numerous princes, and conquered Armenia, which he made a province. The record of the events of the next seven years of Trajan's reign is extremely defective, the few notices in Dion Cassius and others being insufficient for the construction of a consecutive narrative. In 115 he again set out from Syria, directing his march this time against the Parthian Empire. He took Ctesiphon almost without a struggle, and, descending the Tigris, subdued the tribes on both banks, being the first and only Roman general who navigated the Persian Gulf. On his return he found that Mesopotamia, North Syria, and Arabia required to be subdued again. This being done, and Parthia again conquered, Trajan, sinking under a combination of dropsy and paralysis, attempted to reach Italy, but died at Selinus, in Cilicia.

Though most of Trajan's reign was spent in the gratification of his warlike ambition, the internal administration was far from neglected; the administration of justice was vigorous and impartial; that of finance was equally acceptable; informers (*delatores*) were severely punished, and peculating governors of provinces rigorously prosecuted. The improvement and beautifying of Rome was carried on; the Empire was traversed in all directions by new military routes, canals and bridges were constructed, new towns built, the Via Appia was restored, the Pontine Marshes partially drained, the magnificent 'Forum Traiani' erected, and the harbor of Centum Cellæ (Civita Vecchia) constructed. During Trajan's reign a persecution of the Christians, of a mild character, took place.

TRAJAN, Arch of. (1) An arch at Benevento, Italy, somewhat resembling the arch of Titus at Rome, erected in a.d. 114 to commemorate the completion by Trajan of a new road to Brundisium. It is of white marble with one archway 27 feet high, the whole structure being 50 feet in height. The reliefs represent the triumphs of Trajan over the Dacians. The arch is one of the finest and best preserved specimens of the Roman arch. (2) A triumphal arch, in good preservation, at Ancona, Italy, built by the Roman senate in a.d. 112. It commemorates the building of new quays by Trajan. The single archway is 29 by 46 feet in dimension.

TRAJAN, Baths of. Baths built by Trajan on portions of the remains of the Golden House of Nero in Rome. The scanty ruins are situated on the Appian, where some remains may be seen in the Villa Field. They adjoin the Baths of Titus (q.v.), with which they were confused until 1895, on the northeast. The materials of the magnificent edifice were used in limekilns and in constructing other buildings.

TRAJAN, Forum of. An immense group of public buildings in ancient Rome, filling the space between the Capitoline and Quirinal Hills. It was named after its principal builder, the Emperor Trajan, and included the forum proper, entered by the famous Arch of Trajan and containing his equestrian statue in bronze; the Basilica Ulpia; the celebrated Column of Trajan, in the midst of a cloistered court, where were also located the two Ulpian Libraries, one Greek, the other Latin; and the Temple of Trajan, built by Hadrian. See Forum.

TRAJAN'S COLUMN. A celebrated column at Rome, which was reared in A.D. 114, ostensibly by the Roman senate and people, in honor of the Emperor Trajan. The pedestal is covered with bas-reliefs of trophies of Dacian arms, and a very remarkable series of bas-reliefs, forming a spiral round the shaft, exhibits a continuous history of the military achievements of Trajan in his Dacian wars. These are in excellent preservation, and, independently of their beauty as works of art, they are invaluable as records of ancient costume, military operations, and history. A spiral staircase in the interior of the column leads to its summit. The height of the column proper, including base, shaft, and capital, but excluding the lofty pedestal (18 feet), is just 100 Roman feet (29.57 meters). It still stands erect in all its ancient beauty amid the ruins of Trajan's forum. The summit was crowned by a colossal statue of the Emperor, which was incongruously replaced (by Pope Sixtus V., in 1588) by one of Saint Peter. The ashes of Trajan, who died in the East, were said to have been deposited under this column in a golden vase, but no traces of such a burial have been found. Consult: Fröhner, *La colonne Trajane* (Paris, 1872-74); Cichorius, *Die Reliefs der Trajanssäule* (Berlin, 1896 et seq.); Reinach, *La colonne Trajane au musée de Saint-Germain* (Paris, 1896); Petersen, *Trajans dakische Kriege* (Leipzig, 1901).

TRAJAN'S WALL. A line of fortifications stretching across the Dobrudja from Czernavoda, where the Danube bends northward, to a point of the Black Sea coast near Kustendje. It consists of a double, and in some places a triple line of ramparts of earth, from 8¾ to 11 feet in height on the average (though occasionally it attains an altitude of 19½ feet), bounded along its north side by a valley, which, being generally marshy, serves admirably the purpose of a ditch. The construction of this rampart is attributed to Trajan, the general of the Emperor Valens, who in A.D. 377 endeavored by this means to check the advance of the Visigoths. In 1854 Trajan's wall became an important line of defense on the invasion of the Dobrudja by the Russians, and the invaders were twice defeated in their attempts to pass it—at Kostelli (April 10th) and Czernavoda (April 20th to 22d).

TRAJECTORY (from Lat. *trajicere, transjicere*, to throw across, from *trans*, across, through, + *jacere*, to throw; connected with Gk. *ἰάπτειν*, *iaptein*, to throw). In mathematics, any plane curve which cuts at a constant angle a series of plane curves of the same species having a common origin. If the constant angle is a right angle, the curve is called an *orthogonal* trajectory of the system. The question of such a curve was proposed by Johann Bernoulli (1691) in his *Acta Eruditorum*, and Newton (1716) laid the foundation for the theory of trajectories. For the history of the trajectory, consult Terquem, in the *Nouvelles annales de mathématiques* (1845, p. 292). For the various classes, consult Brocard, *Notes de bibliographie des courbes geómétriques* (Bar-le-Duc, 1897, p. 277; partie complémentaire, 1899, p. 181).

TRAJECTORY (in gunnery). See Ballistics.

TRALEE'. A seaport of Ireland, the chief town of County Kerry, on the Lee, one mile from its mouth, and 207 miles west-southwest of Dublin (Map: Ireland, B 4). The town is well built and dates from the twelfth century. Population, about 9000.

TRALLES, trălʹlēz. An ancient city of Lydia, in Asia Minor, on the Eudon River, a northern branch of the Mæander. Its origin was ascribed to Argive and Thracian settlers. It was a thriving commercial centre. Under the Seleucidæ it was known as Seleucia and Antiochia.

TRAM. See Silk.

TRAMP. The American equivalent of the English 'sturdy beggar' and 'vagrant.' His first statutory appearance was in 1876, in New Jersey, and he was soon recognized legally in 21 States. He is commonly defined as an able-bodied man without visible means of support, wandering aimlessly, begging, and refusing work, camping and kindling fires on highways and private property, and terrorizing women and children. What really distinguishes him from the prosaic vagrant of other countries is his extensive use of the railways—stealing rides, or, in his argot, 'jumping trains.' The number of tramps in the United States cannot be accurately given. The closest estimate is one based upon the results of a statistical inquiry made in 1890-91, covering 1349 tramps in 14 cities, and the semi-annual lodging-house census of the Massachusetts Board of Charity. This showed 45,845 tramps in the United States. The highest mark was reached in 1895, when Massachusetts showed a mean daily tramp population of 791, as against 451.4 in 1890, implying a total for the State of 2832, as against 1616 before, and of 79,427 for the United States. The mean has fallen, with but two slight intermissions, since, and in 1902-03 was 369.6, suggesting 1323 for Massachusetts and 38,636 for the United States. This estimate assumes much, but may be accepted as a fair approximation. The average cost of the tramp to the community is about $4.40 a week, independent of his possible depredations; and although 83.5 per cent. of tramps say their health is good, 10 per cent. of them admit having had a dangerous contagious disease.

There are no national repressive laws. Those of the various States have been characterized by a severity born of panic, a not uncommon penalty being twelve months' imprisonment, and in two States sale at public auction for a designated period. Contrary to the common impression, the tramp generally has learned and frequently practiced a trade or profession—57.4 per cent. of the 1349 mentioned above. The proportion of 'professionals,' or those who never work, is extremely small, their real weakness being chronic tendency to intermittency in work. This is fostered by their habits and marital condition, 63 per cent. of them being admitted drunkards, and 93 per cent. unmarried; and again by the conditions of industrial activity, the drunkard being employed only when he is indispensable and discharged, along with the unmarried man, when business slackens, witness the great rise in tramp population after 1873 and the fall after 1901. The statistics seem to show that the surest way of correction lies in prevention.

In England the ancient penalties against what we call tramping were very severe. In the reign of Edward VI. the punishment was branding on the breast with a V and two years' slavery. In 1572 it was whipping for the first offense, boring the ear with a hot iron for the second, and death for the third. A fine of ten times the dole was imposed on the person helping the vagrant. The vagrant may now be lodged in the casual ward of the Union (almshouse), where he must break stone or pick tow in payment.

In Germany the most drastic modern measure against the prime vice of tramping, open mendicancy, was that taken in Bavaria in 1790-95, under Count Rumford, where in four years 10,000 vagabonds were arrested. It proved effective. The number of tramps in Germany is unknown, but is sometimes set at 100,000. The tramp there is the lineal descendant of the old artisan wandering abroad to complete his knowledge of his craft. Beginning in 1854, when Professor Perthes, of Bonn, founded a cheap tavern for them, where no drink stronger than beer could be had, the number of these home refuges, *Herbergen zur Heimat*, increased in 1901-02 to 462, a gain of 72 from 1892 to 1902, with an aggregate of paying guests for the year of 1,931,575 and of non-paying guests or those rendering an equivalent in work of 759,057. For 108,505 of these situations were found. In more or less direct communication with the *Herbergen*, in 240 instances under the same roof, is, on one hand, a great network of local establishments, *Verpflegungstationen*, where lodging and a meal is furnished in exchange for work, generally wood-chopping; or, if there is no separate building, an order is given for cheap entertainment at a local tavern.

On the other hand is a chain of labor colonies, *Arbeiterkolonien*, the first of which was established in 1882 at Wilhelmsdorf, in Westphalia, by Pastor von Bodelschwingh. There are now 33 colonies, with a thirty-fourth allied branch, for Germans, in East London. It is noticeable that 26 of them were established between 1882 and 1892, a decade of especial industrial depression. The thirty-three colonies have accommodations ranging from 35 to 275, with a total of 3865, for men only, and with 3055 occupants (October 31, 1902), and an aggregate attendance from the beginning of 138,392. These work at their trades or otherwise until permanent places are found for them, or they resume their travels. Four of them are under Roman Catholic, one under Evangelical control; the rest are non-denominational. The English branch has room for 83 persons and has had 630 inmates since its establishment in 1900. The efficiency of the German system, which depends on private initiative, has been much contested even in its own home. It seems to be, however, an earnest and intelligent attempt to do a difficult task that cannot safely be neglected.

The French have experimented, under Paris municipal control, along the lines of the labor colony, at La Chalmelle, in the Department of Marne.

BIBLIOGRAPHY. Josiah Flynt, *Tramping with Tramps* (New York, 1899); Wyckoff, *The Workers* (New York, 1897-98); McCook, "A Tramp Census and Its Revelations," in the *Forum* (August, 1893); id., "The Tramp Problem," in *Proceedings of the Conference of Charities and Corrections* (1895), and *Lend a Hand* (September, 1895); id., "Tramps," a lecture, in the Boston *Herald* (1895); id., "Pauperism and Whisky," in *Journal of the Social Science Association* (1894); id., "Leaves from a Tramp's Diary," in *The Independent* (1901-02).

TRANCE (OF., Fr. *transe*, extreme fear, Sp., Port. *trance*, crisis, hour of death, from Lat. *transitus*, passage over, from *transire*, to pass over, cross, from *trans*, across, through + *ire*, to go). A general term in psychology denoting various forms of modified consciousness. The nature of the abnormal nervous conditions that constitute the physiological causes of trance is not clear. The psychological symptoms vary from seeming inanimation to a waking condition, though a manifestly abnormal one, of exaggerated suggestibility in respect to some dominating idea. In general there is more or less insensibility to environment and to ordinary stimuli. What may be termed the waking trance is also characterized by extraordinary concentration or automatic mental action, while the automatic functions of the body are little interrupted. The thoughts of the subject are ordinarily fixed on one kind of idea, frequently religion. In trance-sleep, except in its protractedness and the lessened sensibility to external stimuli, there appears to be little abnormal. In trance-coma these symptoms are more intense and respiration and circulation are feebler. In death-trance, except sometimes the inner dream-life, all animation ceases, including the action of heart and lungs. The thought, or dream, of trance is likely to be more sequential and coherent in character than that of normal sleep. Various pathological and psychopathic conditions are often called trance, such as deep and unusually protracted sleep, lethargy, suspended animation, the hypnotic state, and altered personality. Consult: Charcot, *Leçons sur les maladies du système nerveux* (1883); Mantegazza, *Estasi umane* (1887); Preston, *Hysteria and Allied Conditions* (1897); and for an account of the so-called trance medium Mrs. Piper, *Proceedings of the Society for Psychical Research*, xii.-xv.

TRANI, trä′nė. A seaport in the Province of Bari delle Puglie, Italy, 27 miles by rail northwest of Bari (Map: Italy, L 6). Its ancient walls have given place to spacious boulevards. The twelfth-century cathedral has a very high tower and magnificent bronze doors. The Santa Maria Immaculata is a beautiful church. The Gothic palace (the seat of a priests' seminary) and the old castle (now a prison) are both interesting. Excellent building stone is quarried. Trani first came into notice when it submitted to the Normans in 1073. During the Crusades it carried on a heavy trade with the Levant. Population (commune), in 1881, 25,647; in 1901, 31,800.

TRANSBAIKALIA, trăns'bī-kä'lē-ȧ. A territory of Eastern Siberia, bounded by the Territory of Yakutsk on the north, the Territory of Amur and Manchuria on the east, Mongolia on the south, and Lake Baikal and Irkutsk on the west (Map: Asia, L 3). Area, 236,868 square miles. The region is divided by the Yablonoi Mountains, a part of the Stanovoi (q.v.) chain, into two parts, of which the western has the character of an elevated plateau intersected by a deep valley that extends from Lake Baikal to the Uda River and is used by the chief highways as well as by the Trans-Siberian Railway. The portion east of the Yablonoi chain is lower than the western part, and is traversed in the southeast by the Nertchinsk Mountains. The region is watered by the Argun and Shilka, which unite to form the Amur, the Vitim, a tributary of the Lena, and the Selenga (q.v.), a tributary of Lake Baikal. Of the numerous lakes the principal is Lake Baikal (q.v.). The climate is continental and very severe, the temperature being occasionally as low as —58°. Transbaikalia is one of the most highly mineralized regions of Siberia. Gold is found especially in the Nertchinsk Mountains, where there are also rich deposits of silver and lead. Coal is found near the southeastern shore of Lake Baikal, and iron in many parts. The mining industry, however, is of little importance, and only the gold output (3882 kilograms in 1897) is of any importance. The mines are owned to a large extent by the State and worked by convict labor, the centre of the mining industries being the Nertchinsk (q.v.) region. Agriculture is confined chiefly to the south, where the natural conditions are more favorable. Stock-raising is extensively carried on, and hunting is still of considerable importance. The chief manufactures are leather, spirits, and flour. The transit trade with Mongolia through Kiakhta (q.v.) is large. Population, in 1897, 664,071, of whom the Cossacks numbered about one-third. The aborigines, mostly Buryats and some Tunguses, have still in the main preserved their clan organization, although many of them have been assimilated with the Russians. Capital, Tchita (q.v.).

TRANSCAS'PIA. A Russian territory in Western Asia, bounded by the Territory of Ural on the north, Khiva and Bokhara on the east, Afghanistan and Persia on the south, and the Caspian Sea on the west (Map: Asia, Central, G 2). Area, estimated at from 214,000 to 220,000 square miles. In its general features the region resembles Turkestan, of which it may be considered a western continuation. The larger part of the north consists of elevated table lands with some mountains in the peninsula of Manghishlak in the northwest, and a deep depression near the Khivan frontier in the east. The central part is lower and is practically a desert with shifting sands and dried-up river courses. The southern part is traversed by a mountain chain which separates the sandy deserts of Turkestan from the highlands of Northern Persia, and from its structure and direction appears to be a continuation of the Caucasus system. This region is watered by the Atrek, which flows along the southern boundary to the Caspian and by the Tejend and the Murghab. The whole region is scantily watered. Irrigation is practiced. The coast is indented by a number of deep inlets, of which that of Kara Bugas is noted for its extreme salinity. The climate is hot and dry, and the precipitation extremely meagre. The region contains rich mineral deposits, of which salt, naphtha, ozocerite, and gypsum are mined to some extent. Agriculture is developing in the southern part, which is more favorably situated with regard to irrigation. The principal products are wheat, sorghum, rice, and barley. Cotton is also successfully cultivated. The natives have extensive herds of sheep and other stock, and export skins and wool. A number of household industries, such as rug-weaving and the production of various articles of felt, are more or less developed. The chief medium of transportation is the Transcaspian Railway, which traverses the southern part of the territory. Population, in 1897, 372,193, of whom the Turcomans constituted about two-thirds. Capital, Askhabad (q.v.).

TRANS'CAUCA'SIA. The southern part of the Caucasus (q.v.), comprising the governments of Tiflis, Baku, Yelizavetpol, Erivan, and Kutais and the territories of Daghestan and Kars. Area, about 92,400 square miles. Population, in 1897, 5,461,911.

TRANSCENDENTAL, TRANSCENDENT (from *transcendent*, from Lat. *transcendens*, pres. part. of Lat. *transcendere*, to surpass, from *trans*, across, through + *scandere*, to climb, Skt. *skand*, to spring, ascend). Words employed by various schoolmen, in particular Duns Scotus, to describe the conceptions that, by their universality, rise above or transcend the ten Aristotelian categories. (See CATEGORY.) Thus, according to Scotus, *ens*, or being, because it is predicable of substance and accident alike, of God as well as of the world, is raised above these by including or comprehending them.

Between the hitherto convertible terms transcendental and transcendent Kant drew a distinction, of considerable importance in understanding his own system. By the word 'transcendental' he designates the various forms, categories, or ideas assumed to be constitutive or regulative elements of human experience; although they are manifested only in experience, they are not products of experience. Among such transcendental elements are space and time, causality, and substantiality. The knowledge that these elements are not of empirical origin is called transcendental knowledge. The word 'transcendent' Kant reserves for those objects that lie in the world of things in themselves, entirely inaccessible to experience, and for any pretended knowledge of such objects.

TRANSCENDENTALISM. A term applied in philosophy to Kant's system and to those like it in maintaining that there can be knowledge of transcendental elements. On account of the literary reputation of Emerson and of his colleagues in the Transcendental Club (organized in 1836), and in the Brook Farm (q.v.), the terms Transcendentalism and Transcendental School are now frequently used by English-speaking peoples to designate the views of these thinkers. The so-called Transcendental Movement in New England was mainly confined to that region, and especially to Massachusetts, and, in point of time, to the decades from 1830 to 1850. In its origin it dates much further back, and in its effects it can scarcely be said to be entirely extinct to-day. In character it was partly philosophical, thus connecting with German and French thought; partly economic, thus connecting with French and English schemes of social reform; partly literary, thus connecting with the poetry of such dissimilar characters as Wordsworth and Shelley, and with the gospel of Carlyle; partly theological in a loose sense, thus connecting with Unitarianism; but on the whole, as Emerson averred, primarily spiritual, thus connecting with and finally coalescing in contemporary movements for regeneration of every kind. Putting the matter another way, we may perhaps say that New England Transcendentalism was in the main a result of a revolt from the formalism both of Unitarianism and of Calvinism, which coalesced with a loose system of intuitional philosophy borrowed from Germany, and with the romantic revolt from classicism in literature, as well as with a contemporaneous American movement for securing the benefits of foreign culture (illustrated in Irving and Longfellow among non-Transcendentalist authors), and which finally more or less merged in the great anti-slavery agitation. But any effort to sum up in a single sentence the elements of such a movement for social and individual regeneration must be both clumsy and misleading, and it will be necessary to dwell briefly on each element.

Transcendentalism in New England was involved in the Great Awakening of a century before, for both were spiritual manifestations, the earlier of which did much to shake the hold of rigid Calvinism and to introduce the religious emotionality and liberalism that were later to culminate in men like William Ellery Channing (q.v.) and Theodore Parker (q.v.). Within twenty years after the Awakening, Arminianism and Arianism, through the agency of the Deists and other British writers, had made many converts, especially in eastern Massachusetts. Jonathan Mayhew (q.v.) is typical of these early liberals or Unitarians. The followers of Jonathan Edwards struggled valiantly against the innovators, and held most of New England for orthodoxy, but by 1785 there was a distinctively Unitarian church (King's Chapel) in Boston, even if thirty years were to elapse before this name could be definitely fastened on the seceders from Calvinism. This change of faith was not effected without heart-burning and a development of religious unrest among New Englanders, which made the acceptance of new philosophical ideas, new literary standards, and new social theories all the easier when the time was ripe. The appointment of Unitarian professors at Harvard, resulting in the founding of Andover (q.v.) and the preaching of such men as the younger Buckminster (q.v.) and Channing, undoubtedly prepared the way for Emerson (q.v.) and Alcott (q.v.), for Ripley (q.v.) and Parker.

But although by 1825 Unitarianism had won a decisive victory in Boston and its environs, it was not destined to maintain its ascendency for anything like so long a period as its foe, Calvinism, had done. It, too, showed a tendency to formalism, both in thought and in taste, and impressionable souls soon broke away into new paths of philosophy, theology, and literature. Some little knowledge of Kant and his successors, of Schleiermacher, and of Goethe, had been obtained by a few persons prior to 1830. Before 1840 the labors of George Ripley, F. H. Hedge (q.v.), and other translators had considerably increased this knowledge; in consequence, the influence of German thought upon New England Transcendentalism cannot be ignored, although it is easily exaggerated. French thought, as illustrated by Cousin, and more by Fourier, was less influential, but that there was a decided taste for foreign literature which gave an impetus to the contemporaneous movement for a greater and freer spiritual life seems to be clearly established. This meant dissatisfaction with eighteenth-century standards and with the colonial character of American literature, and thus involved the founding of *The Dial* (q.v.). Nor in this connection should we forget the interest displayed by some Transcendentalists in the Oriental Scriptures, in Neo-Platonism, and in more or less occult literature. But behind the revolt from formal Unitarianism and the craving for new forms of philosophy and literature that characterized many young persons in New England between 1830 and 1840, there was the general uplift of the world's spirit that showed itself in revolutions and in other ways, and there was also on the part of aspiring souls a contempt for the vulgarity and selfishness of American political and business life during the Jacksonian epoch. It is no wonder that New England, which was old and homogeneous enough to produce thinkers and writers, and not merely men of action and affairs, was nevertheless unable to develop orderly schools of thought and literature, and seemed for a time given over to extremists and faddists of all sorts.

If the Transcendental movement was ever organized, this did not take place until 1836 (September 19th), when Emerson, Hedge, Alcott, and others formed the so-called Hedge or Transcendental Club. Little came of this organization until *The Dial* was started in 1840, and Brook Farm (q.v.) founded in 1841. Neither enterprise was fully successful, but both were very influential upon literature and thought, though not greatly upon action. Under Margaret Fuller (q.v.) and Emerson *The Dial* was a hospitable receptacle for the verses of the Transcendentalist poets—C. P. Cranch (q.v.), the younger W. E. Channing (q.v.), and others, whose merits are slowly being recognized—and for many of the best papers of the two editors, and of Thoreau (q.v.). It did not create or recreate American literature, but it undoubtedly stimulated important writers. Brook Farm was laughed at by the hard-headed, and not effectively supported by many of the leading Transcendentalists themselves, but it set up a beneficial ideal of "plain living and high thinking," it furnished Hawthorne material for his *Blithedale Romance*, and it doubtless leavened the utilitarian spirit of the country and the age.

No writer upon New England Transcendentalism has failed to remark upon the exceedingly elusive character of the movement. It is difficult to disengage its elements, to delimit it in point of time, to say what it really accomplished, to determine what it became. If it had been fully organized the case would have been different for the student, yet the results would probably have been less fortunate, both to the Transcendentalists themselves and to the American people at large. Not being hampered by organization, by formulas, by the apparatus of propagandism, the Transcendentalists were better able to serve a more specific cause of greater moment—that of Abolition. They were also enabled to follow the bent of individual genius after having experienced, as Wordsworth had before them, the stimulating effects of having lived in a visionary period, when it was bliss merely to be alive, and when to be young was very heaven. Emerson became the favorite moralist of his countrymen, and an important poet; Alcott gave full vent to his eccentricity, and ended as the patron saint of the Concord Philosophers; Margaret Fuller had a brilliant and only too short career as a critic and woman of letters; Ripley by his reviews in *The Tribune* and his services with C. A. Dana (q.v.) as an encyclopædist showed that a Brook Farmer was capable of valuable, if homely, work in the cause of letters and science; Thoreau revealed nature to his countrymen, and became a high priest of individualism, as well as a writer of truly classic prose; Theodore Parker died just before the beginning of the crusade of which he was perhaps the greatest preacher. Last, but not least, thousands of men and women throughout New England were inspired by Transcendentalism to devote themselves to every form of philanthropy, including educational and temperance reform, to acquire a varied and genuine culture, and to become public-spirited citizens. The era of the Transcendentalists was in many respects an American Renaissance, the effects of which were not confined to this country, but were spread, chiefly through the writings of Emerson, Thoreau, and Channing, to England and to some extent to the Continent of Europe. That their ideas were vague and often transcended reason, not to say common sense, that their literary work was largely amateurish, that their extravagances gave much occasion to legitimate ridicule, that their so-called movement was the forerunner of religious and social manias of all sorts, can scarcely be gainsaid; but it is equally idle to deny the loftiness of their aims and the importance of their works.

Consult the various lives of Emerson, Ripley, Channing, J. F. Clarke, Parker, Margaret Fuller, Alcott, Thoreau, etc. Also Cooke, *Unitarianism in America* (Boston, 1903); id., *The Poets of Transcendentalism* (ib., 1903); Frothingham, *Transcendentalism in New England* (New York, 1876); Swift, *Brook Farm* (ib., 1900); T. W. Higginson, *Old Cambridge* (ib., 1900).

TRANSCRIPTION (Lat. *transcriptio*, from *transcribere*, to transcribe, from *trans*, across, through + *scribere*, to write). In music, an arrangement of a composition for instruments or voices other than those employed by the composer, which really are not transcriptions, but paraphrases. See PARAPHRASE.

TRANSEPT (from Lat. *trans*, across, through + *septum*, *sæptum*, inclosure, partition; connected with *sæpes*, hedge). The projecting wings at right angles with the nave and aisles, forming the smaller arms of the cross, in the ground plan of churches. In some of the largest early basilicas it was placed at the very top, helping to form a T-plan. In such churches the great arch opening from the nave into the transept was called the triumphal arch. When the strictly cruciform plan was introduced for churches in the early Middle Ages (Carolingian period) the transept became quite common, and in the Gothic age almost universal. It shows sometimes in plan, when it projects beyond the line of the side aisles; sometimes only in elevation, when, though not projecting, it is marked by its vault and roof, which intersect the lower roof of the aisles on a level with that of the nave. The intersection is often called the crossing, and was usually surmounted by a spire, tower, or dome, to mark it. The crossing was also usually marked by much heavier piers.

While single transepts were the rule, there were two kinds of double transepts used in England and Germany. The double English transept was on the scheme of the archbishop's or Passion cross, with both arms toward the choir end; the double German transept was connected with the double choir, one at each end of the church. The ends of the transepts in Gothic churches were often treated as façades only second in importance to the main front, with their large rose or wheel windows and their elaborate portals. Those of the Notre Dame in Paris, of Chartres, and Amiens are particularly beautiful.

TRANSFIGURATION (Lat. *transfiguratio*, from *transfigurare*, to transfigure, from *trans*, across, through + *figurare*, to form, from *figura*, shape, form) OF CHRIST. The temporary revelation of the glory of Jesus during His earthly ministry, recorded in Matt. xvii. 1-8, and parallel passages. The festival commemorating it can be traced back to the fifth century, but was established on August 6th as a solemn feast for the whole Roman Catholic Church in 1457, as a thanksgiving for the victory over the Turks near Belgrade. It was retained as a black-letter festival by the Church of England, and restored as a greater feast by the American Episcopal Church at the revision of the Prayer-Book in 1892.

TRANSFORMATION. See MARBLE FAUN.

TRANSFORMER. In electrical engineering, an apparatus for transforming or converting an electric current. Machines for converting alternating currents to direct currents and vice versa are described under DYNAMO-ELECTRIC MACHINERY. Devices for obtaining pulsating currents of high potential from pulsating currents of low potential are described under INDUCTION COIL. The present article treats only of devices used to transform alternating currents into other alternating currents differing in magnitude and potential.

A transformer may be specified as two electric circuits, such as two independent coils of insulated wire inclosing a common magnetic circuit. This will be the case in some degree if the coils are anywhere near each other, but not placed at right angles and so that the plane of one coil passes through the centre of the other. If an electric current is passed through one of the coils, magnetic lines of force (see MAGNETISM) will be created, some of which will thread through the second coil. If the coils are placed contiguous to each other nearly all of the lines of force created by the first coil will thread through the second coil, and if iron is introduced in the magnetic circuit the number of these lines, or the intensity of the magnetic field, will be much greater with a given current in the first coil than if air or other non-magnetic matter only were present. (See MAGNETISM.) A device constituted in this manner of an iron magnetic circuit interlinked with two electric circuits becomes, when one of the electric circuits is supplied with alternating current, an alternating current transformer.

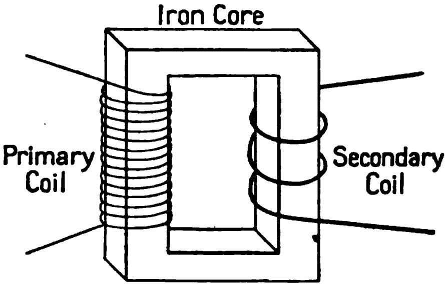


FIG. 1. DIAGRAM OF ESSENTIAL PARTS OF A TRANSFORMER

Starting with no current in either coil, let us consider what happens if we apply an electromotive force to the extremities of the first or primary coil. A current will commence to flow, but will not attain at once to the full magnitude due to the electromotive force applied and the resistance of the circuit. This is because the passage of the current creates a magnetic field, the growth of which in turn creates a counter electromotive force opposed in direction, as the name signifies, to the impressed electromotive force. (See ELECTRICITY.) At the same time that the counter electromotive force is produced in the first coil, an induced electromotive force will be created in the second coil, having the same direction as the counter electromotive force in the first coil, or contrary to the electromotive force impressed upon the first coil. Supposing that the second coil is so connected that it forms a closed circuit, an electric current will be set up in it which will be opposite in direction to the current in the first coil.

It should be noted that an electromotive force is induced in the second coil only so long as the number of lines of magnetic force is changing. If the first coil is supplied from a source of alternating current, this will be continually, since the impressed electromotive force from such a source will increase incessantly from zero to a maximum in one direction, pass back through the zero value to a maximum in the opposite direction, and then fall to zero again. It will be seen that the current in the primary coil will follow a similar cycle of changes, as will also the flux of lines of magnetic force and the induced electromotive force and current in the secondary coil.

It may be assumed that in an ideal transformer all the lines of force created by the first coil pass through the second coil, and further, that there are no losses of energy due to the resistance of the two coils, to eddy currents induced in the windings or in the iron core, or to other causes. In accordance with the first assumption that all lines of magnetic force thread through both coils, the electromotive force induced by variations of the magnetic flux will be the same in every turn of either coil, or, in other words, the total electromotive force induced in each coil will be proportional to the number of turns in that coil. If, say, the primary consists of 100 turns of wire and the secondary coil of 10 turns of wire, and if, further, the primary coil be connected with a source of supply of alternating current having a potential difference of 1000 volts, the potential difference at the extremities of the secondary coil would be 100 volts. Now, while it is seen that the voltages produced are in direct proportion to the number of turns in the respective coils, it will be found that the currents produced bear an inverse ratio. This may be explained as follows:

Assuming the primary coil to be without resistance and also, for the time being, that the secondary circuit is open so that no current can flow, the current in the first coil will be limited entirely by the back electromotive force, and, under the conditions assumed of a highly permeable magnetic circuit, this would almost equal the applied electromotive force and little current would flow. However, a current of sufficient magnitude to create the magnetic field producing the counter electromotive force referred to must flow. This magnetizing current and the magnetic flux it produces will be varying most rapidly when the impressed electromotive force is maximum, since then the counter electromotive force must be greatest, and again, it must reach its maxima, that is, its limits, when the impressed electromotive force is zero. In other words, the magnetizing current is not in phase with the impressed electromotive force, but lags behind, and if the matter is considered in detail it will be found that this current takes energy from the circuit during two parts of the cycle and returns it during two others. Energy is absorbed while the magnetic field is being built up and returned to the supply circuit as the field collapses. If at any time much disparity should begin between the impressed electromotive force and the counter electromotive force, the current and magnetic field would commence immediately to vary rapidly, which would tend to bring the two electromotive forces again into approximate balance. Further, the intensity of this magnetizing current depends only upon the susceptibility of the magnetic circuit, the magnitude of the electromotive force impressed upon the primary coil, and the frequency with which the impressed electromotive force is reversed. Since the counter electromotive force depends on the rate at which the lines of force are created or die out within the coil, if the frequency is great, the magnetic flux, and therefore the magnetizing current, will not need to reach as high values for a given applied electromotive force as if the frequency were low.

It has just been pointed out that in the ideal transformer without resistance or other losses the counter electromotive force prevents any flow of current in the primary in phase with the impressed electromotive force. If, however, the secondary circuit be closed so that current flows therein, this condition no longer continues. The secondary current flows in a direction contrary to the primary impressed electromotive force and alternates simultaneously with it, and so tends to neutralize the magnetizing effect of any current which may flow in phase with the primary electromotive force. It may be here stated that the magnetizing effect of either coil is proportional to the size of its current multiplied by its number of turns. Furthermore, since the secondary coil is required to neutralize exactly the magnetizing effect of the primary current in phase with the applied electromotive force, the secondary current multiplied by the secondary turns must equal the primary current multiplied by the primary turns, that is, the currents will be inversely proportional to the number of turns in the respective coils.

In the example given above, if the terminals of the secondary coil, having a potential difference of 100 volts, are connected by an electrical circuit having a resistance of one ohm, 100 amperes of current will flow, the coil itself, of course, being assumed to have no resistance. The magnetizing effect of this current of 100 amperes flowing through 10 turns of wire will be 1000 ampere turns. Since the primary has 100 turns, the current required to produce the same number of ampere turns will be 10 amperes. By supplying 10 amperes at 1000 volts to the primary we could take 100 amperes at 100 volts from the secondary. In other words, the output of energy (volts × amperes) equals the input.

The actual transformer differs from the ideal transformer just described in the following respects. In the first place, the coils have electrical resistance, and some electromotive force will be consumed in causing current to flow through this resistance. The result of this is that the entire potential difference called for by the ratio of the numbers of turns on the coils does not appear at the secondary terminals and that some electrical energy is converted into heat. It is obviated, as much as possible, by increasing the size and conductivity and decreasing the length of the primary and secondary conductors. In the second place, all the lines of magnetic force created by the primary coil do not pass through the secondary, and vice versa. The result of this again is that the potential difference at the terminals of the secondary coil is not equal to that called for by the ratio of transformation. This effect is reduced to a minimum by a proper distribution of the coils with respect to each other. In the third place, energy is absorbed by the iron core in consequence of the magnetic changes constantly taking place within it. This loss of energy takes two forms, one of which is represented by electric currents (called eddy or Foucault currents) induced in the iron itself. This is prevented, as far as possible, by dividing the iron into laminæ at right angles to the direction of flow of these currents. The second loss of energy in the core is due to the fact that the magnetism of the iron lags behind the magnetizing force, that is, when the magnetizing force is increasing the flux is not as great for a given value of the force as it is for the same value of the force when the force is decreasing. (See MAGNETISM.) This effect, called hysteresis (q.v.), is avoided, as far as possible by choosing the proper grade of iron. The practical effects of these deviations from the ideal transformer are: the first two cause a drop in the potential at the terminals of the secondary coil; this drop increases with the load and the part of it due to the resistance of the conductors represents loss of electric energy which appears as heat; the eddy currents and hysteresis in the iron core represent transformation of electric energy into heat.

The first transformers were constructed by Michael Faraday in England in 1831 and at nearly the same time by Joseph Henry in the United States. Faraday discovered that when the current in a coil was varied a current was induced in a near-by coil of wire, although both were stationary and did not touch. For a long time the only application of this discovery was in the making of induction coils (q.v.), Rühmkorff coils, and other similar small apparatus. With the introduction of alternating currents into electrical engineering, however, the transformer found a wide field of application. For instance, the amount of energy wasted in heat by a current traversing a circuit is proportional to the square of the current multiplied by the resistance of the conductor. The energy transmitted is proportional to the product of the current and the electromotive force. That is, if we have a high enough electromotive force we can transmit a given amount of energy with a very small current, and so with relatively small conductors.

This feature becomes of great importance, since it permits small and less costly conductors, when we wish to transmit energy over a great distance, as for instance from a waterfall to a distant city. But while a high voltage is desirable for transmission, it is dangerous and difficult to control, both in the machinery in which the electrical current is generated and in the apparatus in which it is utilized. By means of transformers, however, the current may at the generating station be 'stepped up' for the trans-

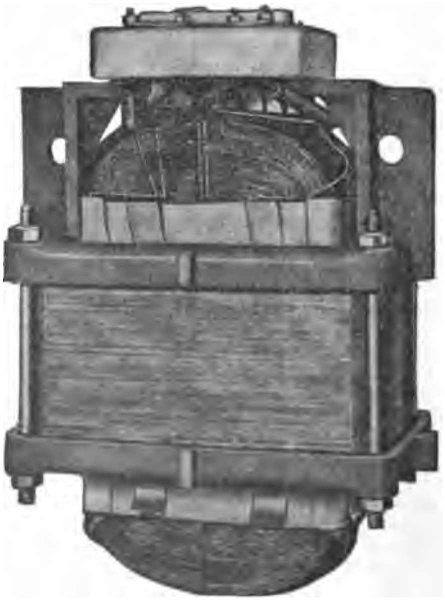


FIG. 2. SHELL TYPE TRANSFORMER, WESTINGHOUSE PATTERN.

mission line and again at the receiving end 'stepped down' to a lower potential for distribution. As an example, the water from the melting snows on the mountains of California is used in water-wheels to drive dynamos generating electric current at a pressure of a few thousand volts or less. This is 'stepped up' by transformers to about 60,000 volts and is transmitted through small overhead conductors nearly 200 miles to San Francisco, where it is 'stepped down' to perhaps 100 volts for ordinary incandescent lighting. See TRANSMISSION OF POWER.

The device which we have outlined is modified in many ways to meet the requirements of various uses, and transformers for the same purposes are built in different forms by different manufacturers. In methods of construction nearly all standard commercial transformers may be put in one of the two classes, shell type and core type. In the shell type of transformer, part of the iron of the magnetic circuit passes around the outside and more or less envelops the primary and secondary windings. In the core type the windings almost completely cover the iron core. Very efficient apparatus is constructed in both forms, each of which has been adopted respectively by one of the two great electrical manufacturing concerns of the United States.

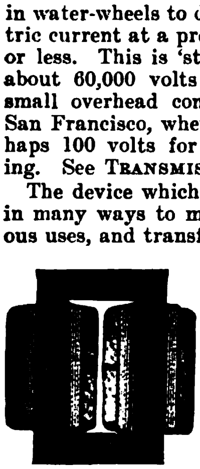


FIG. 3. CORE TYPE TRANSFORMER, GENERAL ELECTRIC CO. PATTERN.

If a transformer is supplied with a constant average alternating electromotive force and is expected to deliver a constant electromotive force from its terminals, as we have assumed in our explanation, it is spoken of as a *constant potential transformer.* To this class the great majority of transformers in commercial use belong. If the transformer is supplied with a constant current and is expected to deliver a constant current, although the voltages may vary, it is known as a *series* or *constant current transformer.* If the secondary of a transformer is inserted in series in one of the distribution lines running from a power station and used to regulate the voltage in that line it is known as a *booster* or *induction regulator.*

Of special transformers for special purposes there are many. *Polyphase transformers* consist of a number of pairs of windings, one for each phase of the electrical circuit, arranged upon a common magnetic circuit. Transformers delivering constant current at a varying potential when supplied with a varying current at a constant potential are used for series arc lighting from constant potential supply mains. This apparently paradoxical result is obtained by so arranging the primary and secondary coils that the magnetic leakage, that is, the lines of force passing through one coil but not through the other, varies with the voltage required in the secondary. This can easily be obtained if the secondary coil is made movable and so arranged that it can swing away from the primary coil, which it will readily do if the current within it increases the least, since the currents of the primary and secondary coils repel each other by virtue of the fact that they flow in opposite directions. Another special form of transformer having a limited application is the *auto-transformer,* in which the primary and secondary coils are united into one. To explain this type we may suppose a coil of 200 turns of wire to be wound on an iron core with a tap taken off at the one hundredth coil. If an alternating electromotive force of 100 volts is applied to 100 turns, sufficient alternating magnetic flux will be set up to produce a counter electromotive force of 100 volts in these 100 coils; but this will also give rise to a similar electromotive force in the remaining 100 coils, so that between the extremities of the 200 coils we will have a potential difference of nearly 200 volts. This type of transformer has many special uses. It is employed, for example, to obtain the low voltages required for starting induction motors, for balancing alternating current, multi-wire distribution circuits, etc.

The capacity of a transformer is limited only by the accumulation of heat in the windings and core. For this reason transformers are often immersed in oil baths, naturally or artificially cooled, or else supplied with a blast of air from a fan.

BIBLIOGRAPHY. Fleming, *The Alternating Current Transformer* (3d ed., London, 1901); Kapp, *The Electric Transmission of Energy and Its Transformation* (London, 1895); id., *Transformers for Single and Multiphase Currents* (ib., 1896); Steinmetz, *Theory and Calculation of Alternating Current Phenomena* (3d ed., New York, 1900); Jackson, *Alternating Currents and Alternating Current Machinery* (New York, 1900); and especially the *Proceedings* of the American and British Institutes of Electrical Engineers, and the current electrical magazines and periodicals.

TRANSFUSION OF BLOOD (Lat. *transfusio,* from *transfundere,* to pour from one to the other, from *trans,* across, through + *fundere,* to pour). The injection into one person of blood taken from another, either directly, from vein to vein, or after it has been defibrinated. The operation has been regarded as legitimate in obstetric surgery since the year 1824, when Dr. Blundell published his well-known work, entitled *Physiological and Pathological Researches.* The operation had, however, been vaguely known to the medical profession for the last four centuries; and there are obscure allusions in the Roman poets, which would seem to indicate that it was practiced as early as the Augustan age. The older operation of transfusion of blood has now given way to the operation of infusion into the veins or subcutaneous tissues of a hot saline solution of a temperature of 100° to 120° F. This solution contains sodium chloride in the proportion in which it is found in solution in normal physiological tissues (about 0.6 per cent.). The amount injected varies usually from one to two pints. It is one of the most useful agents at the surgeon's command in the treatment of shock and the acute anæmia resulting from sudden loss of blood. Consult: Jenning, *Transfusion: Its History, etc.* (London, 1883); Zachrisson, *Experimenteller studier, etc.* (Upsala, 1902); Wallace, "Intra-venous Saline Injections in Shock and Hemorrhage," in *Medical Review* (Pittsburg, Pa., 1896).

TRANS-ISTHMIAN CANAL. The projects for a trans-isthmian canal have included two principal routes, the Nicaragua and the Panama, though there also has been a discussion of a number of secondary routes the principal of which are the Tehuantepec, the San Blas, and the Caledonia Bay. All of these routes have been investigated by engineers and some of them have received continued study for many years. The most thorough and comprehensive study of recent years was that made by the Isthmian Canal Commission in 1899-1900, and not only were the two main routes discussed but also other possible projects as mentioned below. The political questions involved have largely been confined to the Nicaragua and Panama schemes and as these propositions have attracted such widespread attention in the past and as each possesses certain unique features both engineering and otherwise, they will be found treated under their respective heads (see NICARAGUA CANAL and PANAMA CANAL), while below will be given a summary of the features of other proposed routes.

TEHUANTEPEC ROUTE. The well-known geographic conditions at Tehuantepec and between the Nicaragua and Panama Canal routes made it unnecessary to explore those parts of the American isthmus for other possible locations for an interoceanic canal, and the commission mentioned limited its investigations to what is generally known as the Darien country, extending from Panama to the Atrato River.

For about 80 miles the width of the isthmus in this region does not exceed 40 miles, except at one or two headlands which project beyond the general line of the coast. The narrowest point is at San Blas, where the distance from Mandinga Harbor to the shore of Panama Bay is only 31 miles, two miles less than from the head of the bay at Limon, at Colon, to the mouth of the Bernadino. On the eastern side of Panama Bay, about 100 miles from Panama, an estuary known as San Miguel Bay extends into the interior to within 33 miles of Caledonia Bay, on the Atlantic side. This bay of San Miguel, on the Pacific, and San Blas and Caledonia bays, on the Atlantic side, afford excellent harbors and canal approaches. Between Panama and San Blas the ridge of the Cordilleras crosses from the Pacific to the Atlantic side and continues there to the mouth of the Atrato River.

As the existence of practicable and feasible routes in this section depended upon the height and continuity of the divide, its crest was examined all along the line, with as much care and accuracy as was practicable under the conditions which existed, for the discovery of gaps and depressions, so as to ascertain whether any were sufficiently low for canal purposes, and measurements were made of those which promised the most favorable results.

The ridge was traced continuously on the ground from the head of the river Carti, a little east of Mandinga Harbor, in San Blas Bay, to the head waters of the Chagres, and thence down the river to the Panama Railroad a total distance of 24½ miles; also near Caledonia Bay from the Carreto summit, to the Sassardi summit, a distance of 27½ miles. The lowest elevation in the former section was 956 feet, in the latter 683 feet. Between these two sections from San Blas Bay to Caledonia Bay, a distance of 81 miles in an air line, and from Caledonia Bay southward to the Atrato River, the examination was made from the sea, and the elevations of the higher peaks, as well as the gaps and their distances were determined. The result showed that there was no probability of any suitable depression within these limits.

In addition to these investigations, a survey was made from San Miguel Bay, on the Pacific side, up the Chucunaque and Chucurti (Sucubti) rivers, which was almost though not quite connected with the work done near Caledonia Bay. After the results of the general exploration were determined, the examination of other possible routes was limited to those sections where the isthmus was narrowest, where the coast lines offered good harbors, and the indications along the divide were the most promising. These conditions were found near San Blas Bay and Caledonia Bay. East of San Miguel Bay the isthmus widens, and no route can be expected there less than a hundred miles in length.

SAN BLAS ROUTE. The San Blas route extends from the bay of that name to the mouth of the Bayano, on the Pacific; it has been advocated as the shortest line between the two oceans, which is true. The most complete plan developed involves a tunnel at least seven miles long. While not necessarily impracticable, such a tunnel would be very objectionable and would render the line inferior either to the Panama or the Nicaragua location.

CALEDONIA BAY ROUTE. The distance from Caledonia Bay to tide water on the Savana River is about 30 miles in a straight line. Studies have been made of three lines across the divide, all of them striking the same point on the Savana River, near the mouth of the Lara, the approach on the Atlantic side being through the three valleys of the Caledonia, the Aglaseniqua, and the Sassardi. The distance from Caledonia Bay to the mouth of the Lara varies from 32 miles by the Sassardi route to 36 by the Caledonia route. The Sassardi route has not, however, been explored through its whole length, and it is possible that an actual survey would make it as long as the Caledonia route. Each line would require a tunnel. If the Sassardi route were taken, the length of this tunnel, assuming an open cut to be used to the depth of 400 feet, would be about 1.6 miles. On either of the other two the tunnel would be about two miles longer, while the approaches on the south side would be much heavier.

These surveys indicate that the Sassardi route is probably the best of the three for a sea-level canal. The indication cannot be regarded as conclusive, because a thorough survey and development of the sub-surface material might show insuperable difficulties, which would be more likely to exist in the tunnel than elsewhere. The cost of a canal upon this line would be excessive and the tunnel more objectionable to navigation than the locks on the other routes.

Caledonia Bay is virtually tideless. San Miguel Bay has a tidal range of 20 feet or more. This heavy tide causes currents in the Savana River of sufficient force to be a serious menace to navigation, and it would be necessary to build a tide lock near the mouth of the Savana. The distance from the mouth of the Lara to the tide-lock site is about 14 miles, the upper portion of which is in a narrow river which would require enlargement for a canal. This makes the total length of canal navigation from Caledonia Bay to the tide lock about 50 miles.

The result of all these examinations showed that there was no probability of the existence of any practicable canal location between Panama and the mouth of the Atrato River, except by the adoption of a tunnel line, and there seemed to be no reason for further field work except in the interest of geography. See Report of Nicaragua Canal Commission, 1897-99 (Baltimore, 1899) and the bibliography under Nicaragua Canal and Panama Canal, which articles should be read in this connection.

TRANSIT INSTRUMENT (Lat. *transitus*, passage over). An astronomical instrument consisting principally of a telescope fixed to a horizontal east-and-west axis, and revolving in the plane of the meridian. It is employed, as its name denotes, in the observation of the meridian transits of the heavenly bodies, i.e. in noting the exact instants when they reach the meridian of the observatory. The axis, which is the most important part of the instrument, and thus demands the utmost care in its construction, consists of a hollow sphere or cube, to opposite sides of which are tightly fastened the bases of two cones in whose apices the pivots are screwed; the sphere or cube is pieced for the admission of the telescope, which is firmly fastened at right angles to the axis. One of the pivots is hollowed so that a stream of light can be directed from a lantern half way along the interior of the axis, and through an aperture in the side, into the telescope tube, where, being received by a small reflector, set at 45° to the axis and telescope tube, it is directed to the eyepiece, rendering visible a series of fine spider-threads stretched across the field of view. The pivots must be carefully turned to a perfectly cylindrical form, and fitted into the instrument, so that they are accurately in line. One extremity of the axis carries one and sometimes two small graduated circles, each supplied with index, clamping screws, and vernier; these circles are capable of indicating angular measures to within 1′ or 2′. There are three adjustments necessary before a transit instrument can be used: the axis must be horizontal; the sight line of the telescope, as marked by the spider-threads, must be at right angles to the axis of motion; and the latter must be placed so as to point accurately east and west. On the perfection of the first two of these adjustments depends whether the telescope sweeps over a great circle of the sphere, and the third is necessary to insure that this great circle shall be the meridian of the place of observation. These adjustments can never be made quite perfect, and the usual mode is to investigate the amount of error in each, and allow for it by a calculated correction applied to the observed time of the star's crossing the meridian. To note accurately this observed time by the astronomical clock is, as we have said, the essential part of a transit observation. It is best done by means of a chronograph (q.v.), an instrument with which an automatic record of the observed time can be made by means of an electric signal sent out directly from the observer's hand. The transit used by engineers will be found described and illustrated under Engineering Instruments.

TRANSIT OF VENUS. The passing of Venus across the sun's disk, seen when the planet is exactly in line with the sun and the earth. The two planets, Mercury and Venus, whose orbits lie between the sun and the earth's orbit, can at times pass between us and the sun. We can then see them in the telescope, appearing as black dots projected on the luminous solar surface. If the exact instant of time be observed when the planet first touches the solar disk, and again when it finally leaves it, we can use the observations to calculate the solar parallax and the distance from the earth to the sun. Transits of Venus are especially well suited for this purpose, and they have been very elaborately observed in the past, especially in the years 1874 and 1882. Unfortunately, experience has proved that it is impossible to observe the required instants of time with sufficient precision; and other methods of measuring the sun's distance are now preferred by astronomers. (See Parallax; Eros.) The next transit of Venus will occur June 8, 2004. Transits of Mercury will happen on the following dates in the twentieth century:

November 12, 1907.
November 6, 1914.
May 7, 1924.
November 8, 1927.
May 10, 1937.
November 12, 1940.
November 13, 1953.
November 6, 1960.
May 9, 1970.
November 9, 1973.
November 12, 1986.
November 14, 1999.

It will be noticed that transits of Mercury occur much more frequently than those of Venus; but, as we have said, they are not well adapted for solar parallax observations, and are indeed of quite minor importance astronomically.

TRANSKEI (trăns-kī′) **TERRITORY.** A dependency of Cape Colony, between the Great Kei River and Tembuland. Area, 2552 square miles; population, in 1891, 153,563, the region thus being the most densely populated part of Cape Colony. The territory is administered by a chief magistrate and is subject to the 'Native Territories Penal Code.'

TRANS′LEITHA′NIA. A name applied to the eastern division of the Austro-Hungarian monarchy on account of its position east of the Leitha River, which forms a part of the boundary line between the two divisions of the monarchy. See Cisleithania.

TRANSMIGRATION. See Metempsychosis.

TRANSMISSION OF POWER by Electricity. The electrical transmission of energy in considerable quantities from the point of generation to one or more distant points of delivery. This excludes telegraphy and telephony (qq.v.), where energy is transmitted over a wire, but in small quantities.

Energy is transmitted in order to utilize a cheap source of energy supply, and the total cost of generation and transmission to the point of use must be less than would be the cost of generation at the point of use, otherwise such transmission would not be profitable. Therefore, transmission plants are usually supplied by water power or by cheap coal, and the electricity is derived from generators. (See Dynamo-Electric Machinery.) The cost of the transmission depends upon the distance and upon the permissible electrical pressure, or voltage, of the transmission line. The weight of copper required to transmit any amount of energy for any distance at any particular efficiency is directly proportional to the square of the distance, and inversely proportional to the square of the voltage. If the distance be doubled, with the same voltage, the weight of copper will be four times as great; if the voltage be doubled, with the same distance, the weight of copper will be one-quarter as great; if the loss be doubled, the weight of copper, for the same distance and same voltage, will be halved.

This is the fundamental fact in the transmission of energy by electricity; great distances can be economically overcome by the use of high voltages only. This explains the practical elimination of the direct current as a means of transmission; direct-current generators cannot be built in large sizes for more than 1500 volts, on account of trouble at the commutator; to connect a large number of such generators in series involves great difficulties in the use of the energy at the receiving end; the motors must also be connected in series and be insulated to stand the maximum voltage; this limits their use to places where skilled supervision can be exercised. There are a few instances of the use of direct-current transmission in Europe, but in the United States there is none.

The maximum permissible voltage then limits the distance of transmission. What, in turn, limits the maximum voltage? Transformers (q.v.) can be built to operate satisfactorily at 75,000 volts; insulators are now built for use at 60,000 volts and for a test pressure of 120,000 volts; the insulator is at present the weak point of the transmission system, yet it is probable that improvements in insulators can be made at reasonable cost to permit their use up to 75,000 volts. There is, however, another limitation due to the material loss of energy between two wires suspended in air, when the voltage between them exceeds a certain value; this loss is comparatively small up to about 50,000 volts, but increases very rapidly above that point; it can be diminished by increasing the distance apart of the wires, but great increase on a single pole is impracticable, hence it would become necessary to build separate pole lines for the several wires; this added cost may easily be greater than the value of the energy saved by such construction, and a lower voltage may be more economical. The practical limit to the voltage is fixed by the excessive cost of the insulation of transformers and line, rather than by the dielectric loss, and at present 75,000 volts is probably the maximum.

The transmission of energy can be made with as good economy in copper by the single-phase as by the three-phase system (see DYNAMO-ELECTRIC MACHINERY), for the same stress on the insulator, and requires only two wires against three for the three-phase system; but this advantage is more than offset by the fact that there is no good and simple motor that can be used, under ordinary conditions, with the single-phase system. The polyphase system, on the other hand, has come into general use on account of the induction motor, which is self-starting and of extreme simplicity in construction and operation; its commercial introduction gave the first great impetus to the transmission of energy by electricity. Compared with the two-phase system, the three-phase has the advantage of requiring only three wires as against four, and 25 per cent. less copper, hence it is practically the only system used for transmission. Copper wire is generally used, although aluminum has some advantages; the wires are always bare, and are supported by porcelain or glass insulators fixed to cross-arms on poles, which, in the United States, are generally of wood.

The items of the cost of a 10,000 kilowatt transmission plant for 150 miles, at 75,000 volts, with a 10 per cent. loss are: Copper, $20; pole line, $15; transforming stations, $10—a total of $45 per kilowatt. The cost of a water-power plant, excluding the transmission, may vary from $75 to $200 per kilowatt. The cost of the transmission system is then from 18 per cent. to 38 per cent. of the total cost. The annual charges for interest, depreciation, and maintenance of this line will be $6 per kilowatt. Hence there must be at least this difference in the cost of generation at the two points to make the transmission pay. At 37,500 volts, the copper would cost $80—making the total $105 per kilowatt for the transmission; the annual charges would then be $10 per kilowatt. Accurate statistics are not available, and the line of demarcation between a transmission plant and an alternating-current central station is difficult to draw. There are, however, about 200 water-driven electric plants in America, aggregating approximately 600,000 kilowatts, with single stations up to 75,000 kilowatts capacity, and with single generators up to 7500 kilowatts capacity. The maximum distance in daily service is 220 miles; the maximum voltage 60,000; the frequency varies from 25 to 60 cycles, with an increasing tendency to the lower value.

The efficiency of a transmission system is largely determined by the amount of copper, which is in turn determined by economical considerations; it usually falls between 80 and 90 per cent., and is about as high at half load as at full load. The increasing prominence of the steam turbine and the gas engine will probably retard the development of transmission plants in the immediate future, but, looking further, it is inevitable that their importance and value will increase as the coal supply diminishes in quantity and increases in cost.

The best practice in the transmission of energy by electricity is found on the Pacific Coast, and the plants of the Standard and Bay Counties Company, in California, are typical. This company supplies Oakland, San Francisco, Stockton, and a large number of smaller places with electric energy for all purposes. It operates two main power houses at Colgate and at Electra; it also has the Yuba and the Nevada power houses. It has more than 650 miles of pole line and some 800 miles of three-phase circuit, nearly all of aluminum cable; it uses voltages up to 60,000, and operates to a distance of 220 miles, from Colgate to Stockton. The poles are of Oregon cedar or sawn California redwood, of an average height of 40 feet, and carrying either one of two three-phase circuits, the wires being supported on porcelain or glass insulators. The capacity of these power plants exceeds 25,000 kilowatts. For detailed descriptions of modern transmission plants, reference should be made to the files of the electrical engineering journals and the *Proceedings of the American Institute of Electrical*

Engineers. See Dynamo-Electric Machinery; Transformer.

TRANS-MISSISSIPPI EXPOSITION. An exposition held in Omaha, Neb., from June 1 to October 31, 1898. The site covered about 200 acres, a mile to the north of the city. The main buildings, which contained the exhibits devoted to Agriculture, Fine Arts, Machinery and Electricity, Manufactures, Mines and Mining, and the United States Government, were grouped around a grand court which extended through the middle of the grounds and surrounded the lagoon or canal which terminated at its west end into a three-lobed lake 400 feet across, at the extreme west end of which was an electric fountain. The grounds were also skillfully improved by the presence of trees, shrubs, and flowering plants until the arid prairie became so changed as to gain the name of Magic City. The buildings were covered with white staff, adorned with intricate carving and classical statuary, resulting in the production of an artistic effect of remarkable beauty. Of special interest among the amusement features was the ethnological gathering of 500 Indians, representing 25 tribes. The total attendance was 2,613,508, and the total receipts $1,924,077.

TRANSPADANE REPUBLIC. A republic formed by Napoleon in 1796 on the south side of the Po, and in 1797 united with the Cispadane Republic, on the north side, to form the Cisalpine Republic (q.v.).

TRANSPIRATION (from Lat. *trans*, across, through + *spirare*, to breathe). The evaporation of water from the aerial surfaces of plants. The term is used instead of evaporation, first, because the evaporation is modified by the action of the living organisms; and second, because the development of heat within this organism prevents the complete stoppage of evaporation when the plant is surrounded with a saturated atmosphere. In most land plants, transpiration from the epidermal cells is inconsiderable because such become nearly waterproof by cutinization of the outer walls. The cells bordering the interior air chambers (see Aeration) are saturated with water, and from them it evaporates readily into the air occupying these spaces, whence it finds its way by diffusion through the stomata (q.v.). The rate of transpiration will be determined by the relative humidity of the outer air, temperature, wind, light, etc. Transpiration is *unavoidable*, because gases must be absorbed from the air (see Absorption); it is *necessary*, at least to some plants, for cooling; and it is *advantageous* for the movement of dissolved salts. See Conduction.

Since excessive loss of water is one of the greatest dangers to which plants are subject, plants growing in dry regions show a great variety of adaptations to reduce the rate of transpiration and to conserve the moisture which reaches them. (See Xerophytes.) The amount of water transpired varies greatly on account of variation in external conditions and internal structure. A few examples of transpiration under normal conditions will illustrate. In 12 hours on a hot, dry day a sunflower 3.5 feet high, having a leaf area of 5316 square inches, lost 30 ounces of water. The loss of water from 100 square centimeters of leaf surface in 24 hours for the pea was 2.51 grams, for the hop 4.3 grams, for the hemp 9.3 grams. Estimates as to the loss of water during the growing season by the plants of wheat grown on one hectare (about 2.5 acres) equal 1,179,920 liters; and by oats 2,277,760 liters. If all this water could be caught and condensed on the same area it would reach in the first case a depth of nearly 118 millimeters (4⅝ inches), and in the second 228 millimeters (9 inches). A beech tree having 200,000 leaves was estimated to lose between 300 and 400 liters (about 2 barrels) on a hot day.

TRANSPIRATION OF GASES. See Effusion.

TRANSPORTATION (in law). See Admiralty Law; Commerce; Carrier, Common; Maritime Law; Public Callings; Highway, etc.

TRANSPORTATION. The carrying of persons and goods from place to place. The part which transportation plays in the practical life of a community depends most directly upon the complexity of its economic system. Wherever the division of labor and the localization of industry have reached a high degree of development transportation necessarily attains a correspondingly high development. The rise of industry on a great scale and the creation of efficient means of transportation mutually condition each other.

More than a thousand years before our era Phœnician ships were trading in the Mediterranean, and later along the shores of the same sea the Greek cities built up their colonial and trade system. Rome was relatively late in developing maritime traffic, but by the time of the Empire an extensive commercial system had arisen, bringing to Rome the raw produce of Sicily and North Africa, and extending westward even beyond Gibraltar. Ancient land transport was comparatively insignificant. The Greek roads were chiefly to sacred places, such as Delphi, and their economic importance was small. The Roman roads were established for military rather than economic reasons, but they were vastly more extensive. Centring at Rome, they not only stretched through Italy, but (under the Empire) to Constantinople and Asia Minor, along parts of the north coast of Africa, westward to Spain, over the Alps to Gaul, and through Britain. Excellent as these roads often were, their method of construction was wastefully expensive from the modern standpoint.

The return to a more primitive economy in the early Middle Ages meant that for a time transportation should cease to play any important part in the economic life of Europe. The salient points in the story of its gradual revival are the stimulus given by the Crusades to trade with the East, the consequent growth of the Italian cities, and, in the twelfth century, the formation of the great trade league (Hansa) of the North European towns. Although the rise of towns and the establishment of fairs made a certain amount of land or river transport necessary, it was slow, insecure, and costly, and, at least on the Continent, was subject to burdensome and arbitrary tolls. The destruction of the Eastern caravan routes through the Turkish and Mongol invasions gave especial importance to the discovery of an ocean route to the Indies made by Portuguese navigators at the end of the fifteenth century. The introduction of the compass made trans-oceanic voyages readily possible. The discovery of America made them profitable, and helped to shift the centre of trade from the Mediterranean to the Atlantic, from the Italian cities to the Portuguese, the Spanish, and the Dutch. The growth of colonial empires, based essentially on transportation, marks a most important era in the world's economic history.

more adequate means of transport, which only the railroad and the steamship could supply. Through them, in the nineteenth century, international industry has been made possible.

The following table, from the *Report* of the United States Commissioner of Navigation (1902), shows the Merchant Marines of the World, according to Lloyd's Register (1902-03). Only vessels of over 100 tons are included.

COUNTRY	Sail		Steam		Total	
	Number	Net tons	Number	Gross tons	Number	Tonnage
British:						
United Kingdom	1,685	1,533,480	7,358	12,897,592	9,043	14,431,072
Colonies	1,004	360,962	994	754,863	1,998	1,115,825
Total	2,689	1,894,442	8,352	13,652,455	11,041	15,546,897
United States:						
Sea	2,155	1,247,125	776	1,095,788	2,931	2,342,913
Lake	59	135,863	318	858,380	377	994,243
Total	2,214	1,382,988	1,094	1,954,168	3,308	3,337,156
Germany	500	502,230	1,365	2,636,338	1,865	3,138,568
Norway	1,345	766,003	905	866,754	2,250	1,632,757
France	601	415,029	690	1,104,893	1,291	1,519,922
Italy	862	467,241	361	691,841	1,223	1,159,082
Russia	751	244,232	544	556,102	1,295	800,334
Spain	150	48,364	464	736,209	614	784,573
Japan	998	135,351	535	555,230	1,533	690,581
Sweden	789	225,468	719	464,705	1,508	690,173
Holland	109	57,873	320	555,047	429	612,920
Austria-Hungary	42	26,784	259	529,319	301	556,103
Denmark	411	98,483	366	440,010	777	538,493
World's total, including above with all other countries	12,472	6,577,776	17,156	25,859,987	29,628	32,437,763

Land transport lagged far behind that on the sea. With the growth of centralized nations a political motive arose for the improvement of roads and of internal trade. Under Louis XIV. (1643-1715), during the Ministry of Colbert, the French roads were greatly bettered, and many of the local tolls were put aside. In England little effective action was taken by the central Government, and, despite many 'Turnpike Acts' (granting rights to levy tolls in return for maintaining roads) the English highways remained poor throughout the eighteenth century, till the efficient road-making methods of McAdam (1756-1836) and Telford made possible the great improvements of the nineteenth. In the United States, as in England, private or local activity has been chiefly relied on for road-making. Private turnpikes were constructed in colonial times, and during the 'internal improvement' era, after 1800, Federal roads were built. Road-building has been recently carried on systematically in many parts of the United States.

The slowness and costliness of land transportation, even in the eighteenth century, made it impossible to convey ordinary goods any long distance. An era of canal-building, which began in England soon after 1750, met in part the increasing need of the growing industrial centres for communication with one another and with the sea. The same movement appears in the United States in the first quarter of the next century. With the rise of the factory system following 1760, with the application of steam power to mining and manufactures, and the possibilities of machine production on a large scale, came an imperative need for more rapid and

It appears from these figures that steamships now comprise 58 per cent. of the world's vessels (not reckoning China, Turkey, etc.) and 80 per cent. of their tonnage, although for some nations the percentages are much higher. The preponderance of British ships is most notable in steamships. In 1801 there was in the United Kingdom a total net tonnage of 1,786,000; in 1850 the figure was 3,565,000; in 1880, 6,575,000; in 1901, 9,608,000. The percentage of net steam tonnage was 4.7 in 1850, 41.4 in 1880, and 79.2 in 1901. German shipping has grown still more rapidly in recent years. The sailing tonnage has decreased from 1,223,000 in 1885 to 667,207 in 1901, but the (net) steam tonnage has risen from 520,186 in 1885 to 1,057,525 in 1895, and 1,548,667 in 1901.

Before the introduction of iron ships American builders were greatly favored by the cheapness of native timber, and for this and other reasons American shipping was dominant in the world's carrying trade. The tonnage engaged in foreign traffic was 667,000 in 1800; and, though somewhat set back by the War of 1812, it rose to 1,439,000 in 1850 and 2,497,000 in 1861. This was its maximum. The coasting trade has continued to rise from 1,177,000 in 1840 to 2,645,000 in 1860 and 4,859,000 in 1902, including vessels of all sizes. But foreign shipping had fallen to 1,314,000 in 1880, and in 1902 was but 873,000 tons. While in 1860 63 per cent. of the imports and exports of the United States was carried in American vessels, in 1870 the percentage was only 33.1; in 1880, 22.9; in 1890, 16.7; and in 1902, 12.1.

The growth of railway mileage since 1830 is shown in the following table, compiled from the

COMMERCIAL MAP OF THE WORLD.

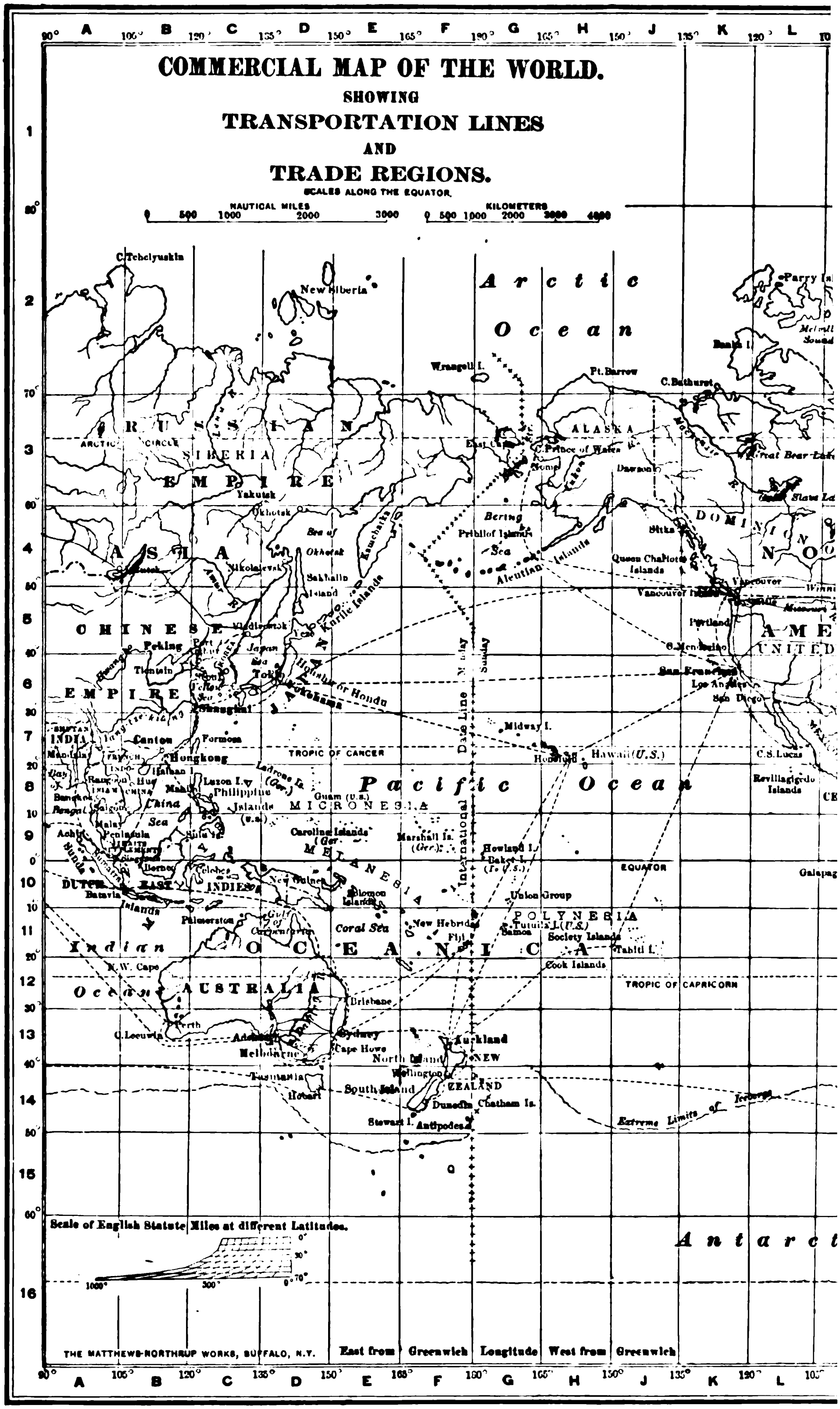
SHOWING

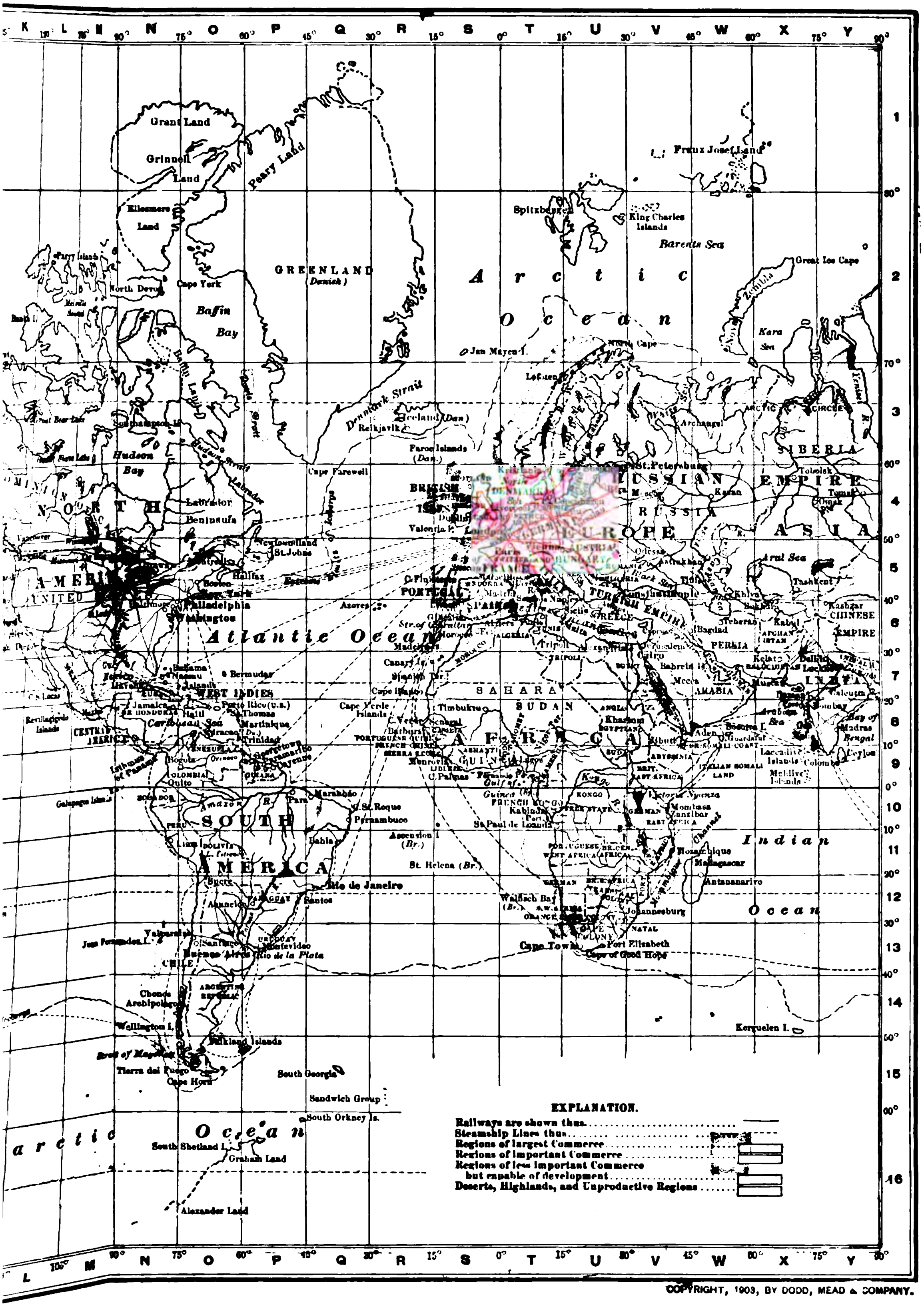
TRANSPORTATION LINES

AND

TRADE REGIONS.

SCALES ALONG THE EQUATOR.





COPYRIGHT, 1903, BY DODD, MEAD & COMPANY.

Journal de la Société de Statistique de Paris (1901-02):

GROWTH OF RAILWAY MILEAGE SINCE 1830

YEAR	United States	Great Britain and Ireland	France	Germany	Russia	The world
1830	23	57	24	....	....	121
1840	2,818	838	303	360	17	4,792
1850	9,021	6,624	1,870	3,761	311	23,980
1860	30,626	10,437	5,865	7,285	989	67,055
1870	52,922	15,151	11,019	12,253	6,982	128,407
1880	93,262	17,929	16,109	21,057	14,617	230,515
1890	166,654	20,334	24,030	26,638	19,225	377,746
1900	194,334	21,932	26,611	31,933	29,892	491,236

The railway equipment, traffic, etc., of certain principal countries is shown in this table:

	United States, 1891	United States, 1901	United Kingdom, 1901	Germany, 1900	France, 1900
EQUIPMENT					
Number of locomotives	32,139	39,584	20,461	19,069	10,775
Number of locomotives, per 100 miles of line	20	20.2	94	60	41
Number of passenger cars	27,949	35,969	45,948	38,434	29,049
Number of passenger cars, per 100 miles	17	18.4	211	123	112
Number of freight cars	* 947,300	1,439,328	706,982	412,744	284,601
Number of freight cars, per 100 miles	587	749	3260	1310	1100
PASSENGERS					
Number carried during year	531,183,998	† 607,278,121	1,172,395,900	842,092,000	453,193
Number carried one mile, in millions	12,844	17,354	....	12,427	7,802
Number carried, per mile of line	79,642	89,721	....	400,960	297,400
FREIGHT					
Tons carried during year	675,608,323	1,089,226,440	413,623,025	367,180,000	('99) 138,600,000
Tons carried one mile, in millions	81,074	147,077	....	23,463	(1899) 10,819
Tons carried per mile of line	502,705	760,414	....	757,040	(1899) 412,722
REVENUE					
Gross earnings from operation, million dols.	1,096.7	1,588.5	518.9	483	295.4
Gross earnings from operation per mile of line, dollars	6,800	8,123	23,457	15,580	12,442
Revenue per passenger per mile, cents	2.142	2.013	....	1st Cl. 1.83 2d Cl. 1.10 3d Cl. 0.638 4thCl. 0.464	(1899) .709
Revenue per ton of freight per mile, cents	0.895	0.750	....	‡ 1.318	1.49
TRAFFIC DISTANCES					
Average journey per passenger, miles	24.18	28.58	....	(1899) 14.3	(1899) 18.1
Average haul per ton of freight, miles	....	251.98	....	(1899) 63.5	(1899) 77.7
Train miles, passenger trains, in millions	307.9	385.1	(1899) 216.4	(1899) 140.9	(1899) 106.1
Train miles, all other trains, in millions	446.2	491.9	(1899) 179.5	(1899) 145.5	(1899) 105.5

* Excluding 51,987 fast freight line cars. † Excluding season-ticket holders. ‡ Excluding express goods.

(Compiled for the United States from Interstate Commerce Commission Reports. For foreign countries, from various sources, chiefly the *Archiv für Eisenbahnwesen*, 1902.)

For further statistics and general discussion of this subject, see RAILWAYS and STEAM NAVIGATION.

BIBLIOGRAPHY. Van der Borght, *Das Verkehrswesen* (Leipzig, 1894); Lindsay, *History of Merchant Shipping* (4 vols., London, 1874-76); Hadley, *Railroad Transportation* (New York, 1886); Picard, *Traité des chemins de fer* (4 vols., Paris, 1887); Gotz, *Die Verkehrswege im Dienste des Welthandels* (Stuttgart, 1888); Van Oss, *American Railroads as Investments* (New York, 1893); Davis, *The Union Pacific Railway* (Chicago, 1894); Fry, *History of North Atlantic Steam Navigation* (London, 1896); *Bibliographies* in Borght, op. cit., and *Publications of Stanford University, 1895* (Hopkins Railroad Library); *Interstate Commerce Commission Reports* (annual); Poor's *Manual of Railroads* (annual); *Reports of the Commissioner of Navigation* (annual); *Archiv für Eisenbahnwesen; Statistical Abstract of the United Kingdom; Statistisches Jahrbuch des Deutschen Reichs* (annual); etc.

TRANSPORTATION, PENAL. Banishment from society in the form of exile, ostracism, or outlawry. The practice is well known among uncivilized peoples, and existed among the ancient nations and in mediæval Europe. In England, under a statute of Elizabeth (1597), 'dangerous rogues' might be banished by justices in quarter sessions, but no system of transportation can be said to have arisen till the time of Charles II., when justices were empowered to send certain offenders to America instead of inflicting the death penalty. In 1717 transportation was authorized as a substitute for other punishments than hanging, and the contract system, by which individuals agreed to transport convicts in return for their labor during the period of sentence, was established. The business was profitable at first, but became less and less so, until a payment had to be made for each criminal transported. Protests from America were frequent, but were unavailing. After 1776 a twofold system was developed. To meet the immediate need, hulks stationed in the Thames (later at Portsmouth and other places) were arranged to receive convicts; and though this was begun merely as a temporary expedient, it endured as a legalized system for over three-quarters of a century. Involving as it did the crowding of prisoners under extremely bad sanitary and moral conditions, the hulk system was severely criticised by several Parliamentary committees, but it was abolished only gradually, as penitentiaries were constructed.

Within a decade after 1776 another settlement for criminals had been found in Australia. In 1787 the first lot of convicts left for New South Wales. In 1804 they began to be sent to Tasmania. The number transported was at first small. The annual average up to 1816 was less than 500, but it rose to 3000 during the twenties and thirties. The spirit and practice of the system were essentially penal, not reformatory, and conditions of life in a colony where the majority of persons were convicts were almost inevitably bad. The report of the Parliamentary committee of 1838 condemned the system at almost all points, and a few years later (1842) a 'probation system' was planned by which prisoners were classified and might pass through various stages toward pardon or freedom. The essential difficulty of the scheme was to find work in the colonies for ticket-of-leave men or 'probationers,' while the matter was further complicated by an increasing objection of the colonists to the importation of convicts. Transportation to New South Wales ceased after 1849, and to Tasmania after 1852. Thenceforth Western Australia was the only outlet, and though the probation system, improved in 1847, worked there successfully, the colony was quite unable to provide for all English convicts. With the development of the system of penal servitude (1853-63) transportation declined, and the last shipment of criminals to Western Australia was in 1867.

In France penal transportation was established by a law of 1854. Guiana was at first utilized as a place to send criminals, but its climate proved quite unsuitable, and except for negro convicts it has been abandoned as a penal settlement since 1867. Mention might be made, however, of the notable exception of Captain Alfred Dreyfus (q.v.). In 1864 convicts were sent to New Caledonia, where conditions have been much more favorable; but, though the system still continues in use, it is not regarded with much favor. Russia is the only other modern nation which has practiced transportation on a large scale. Siberia was made a place of settlement in the seventeenth century, and after the discovery of the mines the system grew apace. Between 1807 and 1899 it was estimated that 865,000 persons had been transported to Siberia. Since 1869 the island of Saghalien (q.v.) has been used largely as a penal colony. In 1896 it contained 15,000 convicts and exiles, and less than 3,000 free settlers. The horrors of Siberian exile which Krapotkin, Dostoyevsky, and others have told to the Western world, have been considerably mitigated in recent years. Convict labor does not prove of permanent economic advantage, and in Siberia, as elsewhere, it has been found impossible to colonize a country with convicts. In 1900, following the investigation of a commission of 1899, the Russian penal system was radically reformed. Imprisonment is to take the place of exile for all except political and religious offenders. No further attempt is to be made to settle convicts as colonists, but all those exiled will remain imprisoned during their sentences. Consult: Du Cane, *Punishment and Prevention of Crime* (London, 1885); Wines, *Punishment and Reformation* (ib., 1895); Holtzendorff, *Die Deportation als Strafmittel* (Leipzig, 1859); Krapotkin, *In Russian Prisons* (London, 1887); Kennan, *Siberia and the Exile System* (New York, 1891); De Windt, *The New Siberia* (London, 1896).

TRANSPOSING INSTRUMENTS (from *transpose*, OF., Fr. *transposer*, from Lat. *transponere*, to transpose, from *trans*, across, through + *ponere*, to place). Those musical instruments whose natural scale is always expressed in C major irrespective of the actual pitch. Such instruments are the horns, trumpets, cornets, tubas, clarinets, and cor anglais. The C major scale when played upon the B flat clarinet is identical in pitch with the B flat major scale. In order to play the real C major this instrument must play the scale written as D. In a composition in the key of F major the signature of the strings and all non-transposing instruments will, of course, be one flat; whereas the B flat clarinets must be written in the key of G. See MUSICAL INSTRUMENTS.

TRANSPOSITION (Lat. *transpositio*, from *transponere*, to transpose). In music, the performance of a composition in a key other than the one in which it was written by the composer. Vocal works are most frequently transposed, as when a tenor wishes to sing a work originally written for low voice. Transposition occurs also often in transcription. Singers have no difficulty in transposing a song into any key, but the transposition at sight upon any instrument, especially the organ or pianoforte, is difficult. See SCORE.

TRANSUBSTANTIATION (ML. *transubstantiatio*, *transsubstantiatio*, change of substance, from *transubstantiare*, *transsubstantiare*, to change to another substance, from Lat. *trans*, across, through + *substantia*, substance, essence, material, from *substare*, to stand under, be present, from *sub*, under + *stare*, to stand). A word used by Roman Catholic theologians to designate the change which they believe to take place in the Eucharistic elements of bread and wine, in virtue of the consecration. The term was first officially adopted by the Church at the Lateran Council of 1215, and the doctrine involved by it explicitly defined as an article of faith by the Council of Trent: "The whole substance of the bread is changed into the body of Christ, and the whole substance of the wine into His Blood, the species alone remaining."

The definition of the manner of Christ's presence is really rather a philosophical than a theological one, resting as it does upon the Aristotelian system of philosophy adopted by the mediæval theologians. It is based upon the belief in the existence in everything of an essential distinctive principle not cognizable by the senses, called 'substance;' the 'species' or 'accidents' of the thing are qualities which are perceived by the senses—color, taste, smell, solidity, etc. In transubstantiation, accordingly, the *accidents* remain unchanged, while the underlying *substances* of bread and wine cease to exist, their places being taken by the *substance* of the body and blood of Christ. The objections to the doctrine have been chiefly drawn from the philosophical difficulties which are involved in it; and the defenders of it have therefore added to the proofs which they profess to draw from the Scripture and tradition a general demonstration that the doctrine, although mysterious, does not involve any philosophical repugnance or impossibility. Leibnitz (q.v.), although a Protestant, has not only entered at great length, and in several portions of his works, into this philosophical discussion, but professes to prove, by strict philosophical principles—by the consideration of the properties of matter, of substance, of space, extension, and the like—that the essential principle of the body "may exist in many places at the same time, nay, under far-distant and distinct species."

Consult, for an excellent English treatment of both philosophical and theological aspects of the question, Dalgairns, *The Holy Communion* (Dublin, 1861); and see Lord's Supper; Substance.

TRANSVAAL, trăns-väl′, or Transvaal Colony; formerly South African Republic. A British possession in South Africa. It is situated between latitudes 22° and 28° S., and longitudes 25° and 32° E., and is bounded on the north by Matabeleland, on the east by Portuguese East Africa and Swaziland, on the south by Natal and the Orange River Colony, and on the west by Bechuanaland and the Bechuanaland Protectorate. There were transferred to Natal, in January, 1903, 7000 square miles of area, including the districts of Vrijheid, Utrecht, and a section of the Wakkerstroom district, with a total population of nearly 60,000, 8000 being whites. The area of the Transvaal is about 104,000 square miles.

The interior of the Transvaal is a plateau lying on an average about 6000 feet above sea level. In the east this plateau is terminated by the northern Drakensberge, with the highest point (Mauch Mountain) reaching nearly 9000 feet. On the eastern border are the Lebombo Mountains. Across the interior plateau stretches from east to west the far-famed Witwatersrand, with Johannesburg and the rich gold fields, which separates the Limpopo and the Vaal basins. Just north of the Witwatersrand and in general parallel with it extend the Magalies Mountains. Pretoria lies at the eastern outlet of the narrow valley thus formed. In the centre of the extensive Drakensberge system, which occupies the whole eastern third of the colony, is Barberton with its gold fields. The Transvaal is well watered. It is drained mainly by the Limpopo River, which forms the boundary on the northwest and north, and the Vaal River, which forms most of the southern boundary. The Olifant River, the principal affluent of the Limpopo, has nearly its entire course within the Transvaal. The Barberton region is drained by the Komati, which flows into the Indian Ocean. None of the rivers of the Transvaal, however, are navigable.

The climate west of the Drakensberge and south of the Magalies range is subtropical, with a European character. The mean annual temperature is 67° F. January is the warmest, July the coldest month. There are winter frosts. The northern and eastern sections of the Transvaal are more tropical, especially the valley of the Limpopo. December, January, and February witness the heaviest rainfall. The west is the driest. The climate of the interior uplands is noted for its healthfulness. Among the distinctive trees are the thorny acacias and the eucalyptus. The range of plants is very large, including the European grains and many of the valuable tropical species. The northeastern section is the least fruitful. The lions and elephants have been driven into the north and northeast parts. The flocks and herds of the Boers were very large before the war of 1899-1902, and horses were also bred, though to a much less extent.

Granite and slate are in general the basic formations, upon which rests the so-called 'Cape Formation,' above which are found quartzite and coal-bearing layers. The Transvaal is exceptionally rich in varieties of mineral wealth, such as copper, iron, coal (in different sections), lead, silver (north of Pretoria), diamonds (in the Pretoria district, and in the southwest corner in the direction of Kimberley), and notably gold. Gold was first discovered in 1867, and is now found abundantly in numerous districts. The rich gold fields of the Witwatersrand—'The Rand'—(of which Johannesburg is the mining centre), and those of Barberton, have made the Transvaal particularly famous. Around them developed the history of the colony. The value of the gold taken out from 1884 to 1898 was $350,000,000. The mining operations after 1899 were seriously interfered with by the war and for more than a year ceased altogether. In eleven months in 1902 1,500,000 ounces were obtained. In that year nearly 50,000 natives were employed in the mines. In 1898 diamonds were taken out to the value of $200,000. There has been no output of copper and silver in later years. Coal was a noteworthy item before the recent war, and was mined to the amount of $3,000,000 in 1898.

The country is well adapted to agriculture and stock-raising, though its possibilities are as yet meagrely developed. The acreage in farms is estimated at less than 600,000. After the war of 1899-1902 three-fourths of the burghers soon returned to their lands. The Government made loans to aid them in raising the crops, and land was rented on shares under favorable conditions to the more indigent. Syndicates of farmers borrowed money in a large lump sum, massing all their assets together as security. The proceeds were to be used for only a given number of families. The number of live stock in the colony is unknown. The manufacturing interests are in their infancy. There are 11 factories for machinery, 9 for tobacco, 19 for mineral waters and ices, and 3 for explosives, several printing works, and numerous saw mills.

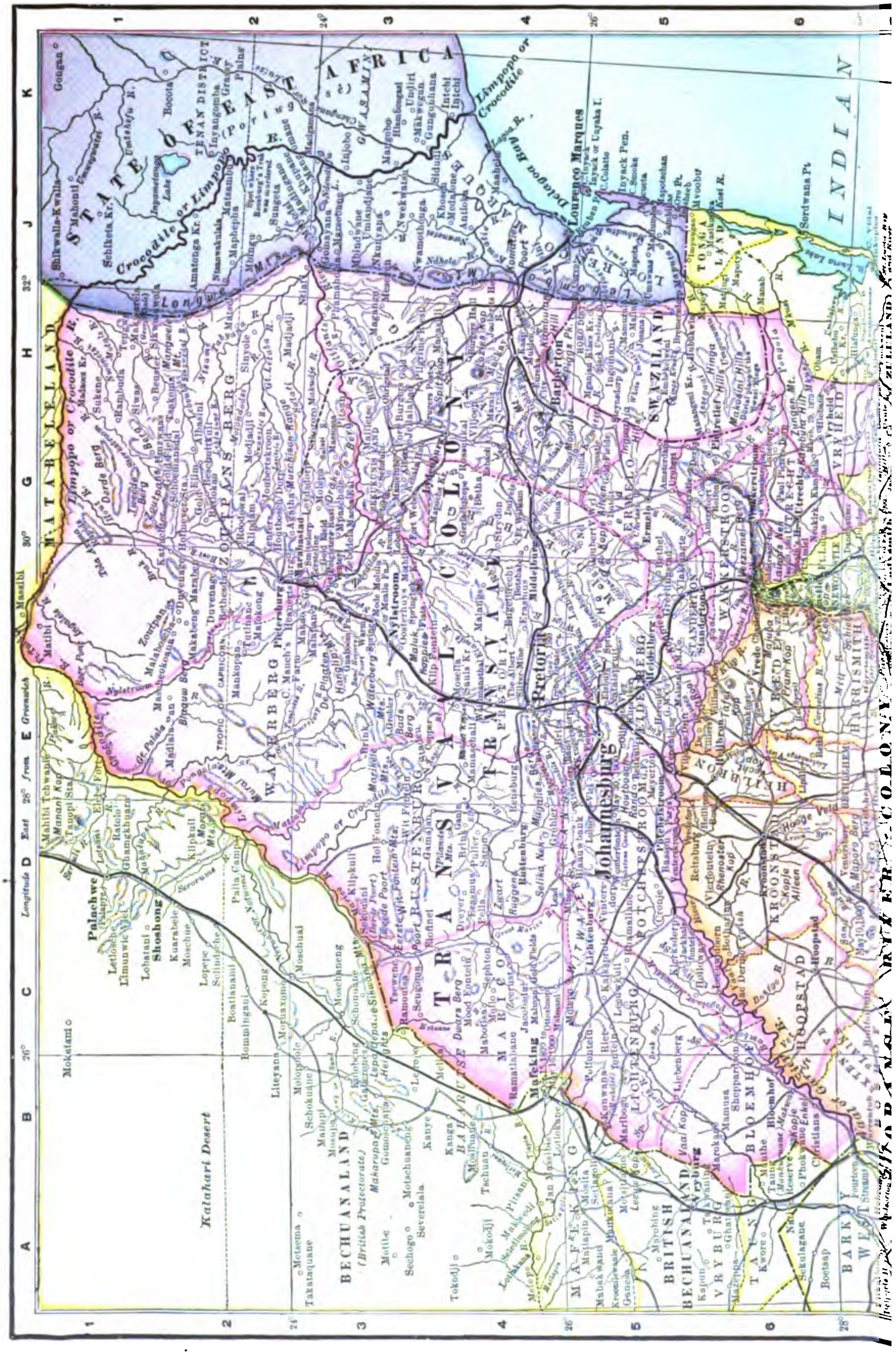
The imports for 1901 were valued at £3,670,365. The figures for 1902 evidently quadrupled this sum. The main articles are clothing, provisions, metals, and manufactures of metals. The largest amount comes through Cape Colony, though almost as much enters through Natal. Comparatively little comes via Delagoa Bay. The figures for exports are not given. The principal articles shipped out are gold, hides, cattle, wool, ivory, and ostrich feathers. The colony has railway communication with the important sister colonies and with Portuguese East Africa. The mileage is about 700.

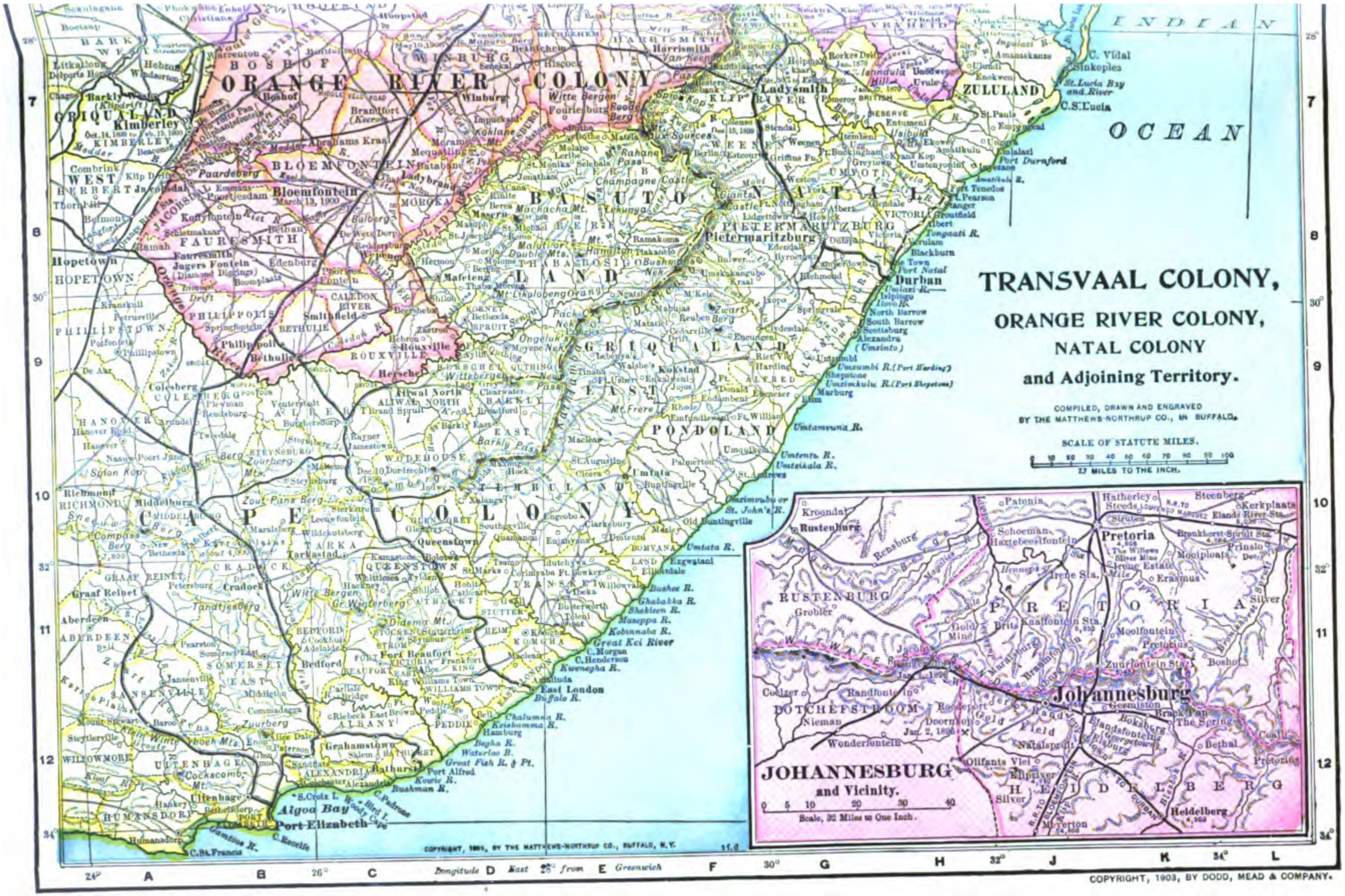
The colony was annexed to Great Britain September 1, 1900. Hostilities with the Boers definitively ceased in May, 1902. Certain privileges were allowed the Boer population, such as the use of Dutch in the courts and public schools where desired. Civil government was to replace the military régime as soon as practicable. The colony is administered by a Governor, Lieutenant-Governor, and an Executive Council. There are 20 districts. The capital is Pretoria (q.v.). Johannesburg, the principal city, is, however, to some extent an administrative centre. For the fiscal year 1901-02 the civil revenues and expenditures each were upward of $7,000,000. For the following fiscal year the estimated revenue increased to nearly $20,000,000, derived from customs chiefly. Mines and railways also contributed. For this last-named year the expenditures were put at $18,500,000, of which one-third was devoted to the South African constabulary, though most of this last-named amount would be recovered by the Transvaal from the Orange River Colony and the British Government. The total sum voted by the Imperial Government for the Transvaal and Orange River colonies in 1901 and 1902 was $40,000,000, including $500,000 for the South African constabulary and $4,000,000 for railways. The Boer public debt at the close of 1898 was $13,000,000, and against this was to be reckoned the value of the State lands, then not so valuable as now since gold has been found on them. The debt occasioned by the war is figured at $150,000,000. A total loan was to be floated of $175,000,000, to be guaranteed by Great Britain and based on the assets of the Transvaal and Orange River colonies. Productive public works will be undertaken. The seven banks in the Transvaal have a combined capital of £7,000,000. The weights and measures are those of Cape Colony. English currency and coins minted at Pretoria circulate. As to the military control, the colony is divided into five districts. The British commander-in-chief for all South Africa is stationed at Pretoria. There is a constabulary. A volunteer force is also to be formed for the colony.

The population in 1896 was 1,094,156, of whom 245,397 were whites and 748,759 natives. The religious population is estimated as follows: in the Dutch churches, 63,000; in other Protestant churches, 53,000; Jews, 10,000; and Roman Catholics, 5000.

HISTORY. The Transvaal was one of the two States founded by the Boers after the 'great trek,' or emigration, from Cape Colony. These Boers were descendants of the colonists who had come into South Africa under the Dutch control. They were a hardy, vigorous, bigoted race, holding the natives in slavery and hence not getting along well with their savage neighbors. The dislike of the English which naturally arose after the latter took possession of Cape Colony in 1806 culminated in 1833 when the emancipation law was passed. Some years later a considerable number of the Boers went north with their families, flocks, and household goods, and at first founded a colony in Natal. This was broken up by the British Government in 1843 (see NATAL) and the Boers, going westward, founded the Orange Free State. (See ORANGE RIVER COLONY.) In 1848 this also was taken under British control (remaining thus, however, only for a few years), and the more irreconcilable of the Boers 'trekked' once more, across the Vaal, and founded the South African Republic, commonly known as the Transvaal. By the Sand River Convention, concluded in 1852, Great Britain recognized the independence of "the emigrant Boers living north of the Vaal River" and boundaries were duly established. The new State was for some years allowed to take its own course and the only interference with its increasing prosperity came from the struggles with the natives, between whom and the Boers there was bitter enmity. In 1877 some discontented burghers suggested to the British Government that the Transvaal should be taken under its protection. Mistaking the appeal of a faction for national sentiment, the British commissioner, Sir Theophilus Shepstone, declared the Republic British crown territory, and annexation was persisted in by the British Government, in spite of repeated appeals. In 1880 the people revolted against the British régime. On December 13th a mass meeting was held at Heidelberg and the restoration of the independent Republic was declared. A brief campaign, in which the Boers developed remarkable fighting powers, according to methods especially adapted to the country, followed this act. The Boer victories of Laing's Nek and Ingogo were followed by the battle of Majuba Hill (February 27, 1881), which resulted in the worst defeat sustained by British arms in many years. On August 8, 1881, peace was concluded by the convention of Pretoria, in which self-government was restored to the Transvaal burghers, subject to the suzerainty of the British Crown. This latter reservation gave Great Britain the right to maintain a British resident in the country and to march her armies across the territory in time of war and also the control of external relations. The convention of London, signed February 27, 1884, omitted the suzerainty clause and the Boers claimed that thereby Great Britain gave up all control over their affairs. The British Government, on the contrary, maintained that the convention of London was supplementary to that of Pretoria, and that the latter was in force except where directly contravened by the former. In the years 1881-93 several events occurred which reacted upon the relations of Great Britain and the South African Republic. The first of these was the formation in Cape Colony of the Afrikander Bund, with a platform calling for a union of European races in South Africa on a basis of South African nationality and independence. This movement increased the dislike of the British Government to the development of any strong, independent power in the neighborhood of the British South African possessions. The advance of the English into Mashonaland and Matabeleland, which the Boers had coveted and which hemmed them in, was to them an added irritation; and the climax was reached in the aggressive attitude of the British South Africa Company, which held rights of exploitation and administration in the new British territories.

The discovery of gold in the Transvaal in 1884 opened a new and troubled era. Hitherto the country had been agricultural and rural, with a homogeneous population. Now there was a sudden influx of mining men, promoters, and adven-


TRANSVAAL COLONY
ORANGE RIVER COLONY
PORTUGUESE EAST AFRICA
MATABELELAND
BECHUANALAND (British Protectorate)
BRITISH BECHUANALAND
SWAZILAND
TONGA LAND
Kalahari Desert
INDIAN
Delagoa Bay
Lourenço Marques
Pretoria
Johannesburg
Mafeking
Barberton
Limpopo or Crocodile R.
Tropic of Capricorn
Longitude East 28° from Greenwich
ZULULAND



TRANSVAAL COLONY,
ORANGE RIVER COLONY,
NATAL COLONY
and Adjoining Territory.

COMPILED, DRAWN AND ENGRAVED
BY THE MATTHEWS-NORTHRUP CO., IN BUFFALO.

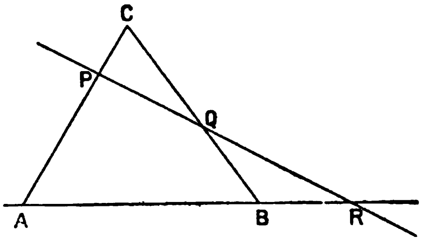
COPYRIGHT, 1899, BY THE MATTHEWS-NORTHRUP CO., BUFFALO, N.Y.

COPYRIGHT, 1903, BY DODD, MEAD & COMPANY.

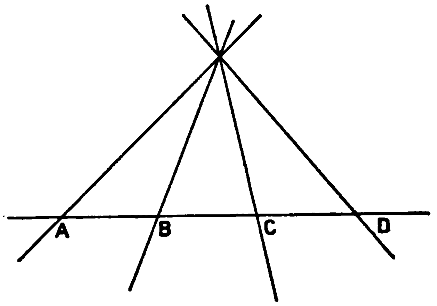
turers of all nations. In the Witwatersrand was founded the populous mining city of Johannesburg, inhabited very largely by these Uitlanders, or outlanders. The Boers felt that the primitive life they had wished to preserve was invaded, circumscribed, and likely to be overwhelmed. They therefore sought to restrict the privileges of citizenship, in order to retain the political control in their own hands. This led to constant friction and to attempts to secure British intervention. It is impossible in the limits of this article to discuss the many points of difference which brought to a head the troubles between Great Britain and the Republic. In the autumn of 1895 a plan was arranged between the leaders of the British South Africa Company —Cecil Rhodes (q.v.), his colleague, Mr. Beit, and Dr. Jameson, administrator of Rhodesia—on the one hand, and several leaders of the Uitlanders —Lionel Phillips, Charles Leonard, and John Hays Hammond representing them—on the other, for an armed raid into the Transvaal from Rhodesia, for the purpose of bringing about by a display of force the reforms desired. Dr. Jameson made it understood finally that he should act in behalf of the British supremacy. The Johannesburg committee did not apparently intend to overthrow the Government, and when this was known sought to stay action while they issued a manifesto calling for the desired reforms. Jameson, disregarding their warning, entered the Transvaal December 29th with 600 men. He was defeated, surrounded, and obliged to surrender (January 2, 1896). The Transvaal Government turned the prisoners over to the British Government for trial. They were convicted in England and received light sentences. Four of the Johannesburg leaders were condemned to death by the Transvaal courts, but this was commuted to a heavy fine. The raid caused a great excitement and assumed international importance. It brought the agitation and the bitter feeling between the two countries to an acute stage. The controversy, concealing under diplomatic phraseology much irritation on both sides, continued for some time longer. Mr. Chamberlain, the English Colonial Secretary, seemed determined to force the position of the Republic, and President Kruger was obstinate in his refusal to yield any important point. In the autumn of 1899, when war seemed imminent, the Orange Free State decided to make common cause with the South African Republic. On October 9th an ultimatum which made peace and continued negotiation impossible was presented to the British agent at Pretoria and Mr. Chamberlain summarily closed the correspondence. For the subsequent history of the Transvaal, see SOUTH AFRICAN WAR.

BIBLIOGRAPHY. Aylward, *The Transvaal of To-Day* (Edinburgh, 1881); Wangemann, *Südafrika und seine Bewohner* (Berlin, 1881); Albrecht, *La république sudafricaine* (Brussels, 1889); Klössel, *Die Verfassung und Verwaltung der südafrikanischen Freistaaten* (Leipzig, 1896); Abraham, *Die südafrikanische Republik* (Berlin, 1896); Statham, *South Africa as It Is* (London, 1897); Seidel, *Transvaal, die südafrikanische Republik* (Berlin, 1898); Bryce, *Impressions of South Africa* (London, 1899); Younghusband, *South Africa To-Day* (ib., 1899); Tangye, *In New South Africa* (ib., 1900); Keane, *The Boer States, Land, and People* (ib., 1900); Colquhoun, *Renascence of South Africa* (ib., 1900); Belloch, *The New South Africa* (ib., 1091); Leclerq, *Les Boers et les origines des républiques sudafricaines* (Brussels, 1901); Alford, *Geological Features of the Transvaal* (London, 1891); Distant, *A Naturalist in the Transvaal* (ib., 1892); Pollack, *Les mines d'or du Transvaal* (Paris, 1894); Goldman, *South African Mines* (London, 1895-96); Talbert, *Nach den Transvaal-Goldfeldern* (Berlin, 1896). HISTORY. Theal, *History of South Africa* (London, 1887-93), the fullest and most reliable history of South Africa as a whole; id., *History of the Boers in South Africa* (ib., 1887); Cloete, *History of the Great Boer Trek* (ib., 1899); Statham, *Paul Kruger and His Times* (ib., 1898); Voigt, *Fifty Years of the History of the Republic of South Africa, 1795-1845* (ib., 1899); Aubert, *Le Transvaal et l'Angleterre en Afrique du Sud* (Paris, 1899); Bryce, Brooks, and others, *Both Sides of the South African Question* (New York, 1900); Creswicke, *South Africa and the Transvaal War* (Edinburgh, 1900); Fisher, *The Transvaal and the Boers* (London, 1900); Mahan, *The War in South Africa* (ib., 1900); Doyle, *The Great Boer War* (ib., 1900); Ireland, *The Anglo-Boer Conflict* (ib., 1900), a concise account, pro-British, but moderate and not unfair; Ogden, *The War Against the Dutch Republics* (Manchester, 1901).

TRANSVERSAL (ML. *transversalis*, from Lat. *transversus*, *traversus*, *transverse*, p. p. of *transvertere*, to cross, transverse, from *trans*, across, through + *vertere*, to turn). In geometry, a term commonly applied to a line cutting a pencil of parallels. In modern geometry the term is extended to mean any straight line cutting the other lines of a figure. Thus any line intersecting the three lines forming a triangle ABC in P, Q, R, is a transversal of the triangle. The theory of transversal is one of the most important in modern geometry. It has its origin in a theorem attributed to Ptolemy (q.v.), but which is found in the *Spherics* of Menelaus (q.v.), and which has been thought to go back to Hipparchus (q.v.). This states that a straight line drawn arbitrarily in the plane of a triangle determines on the lines of its sides six segments such that the product of three not having a common extremity equals the product of the other three. Pappus (q.v.) in his *Collections* approaches the theory from another standpoint and shows that if a pencil of four lines be cut by a transversal in the points A, B, C, D, the ratio $\frac{AC}{AD} = \frac{BC}{BD}$ is constant for any position of the transversal. Pappus also showed that if a transversal cuts the sides and diagonals of a complete quadrilateral, the six segments determined on this



transversal are such that the product of three not having a common extremity will equal the product of the other three; that each diagonal is cut harmonically by the other two; and that when a hexagon has three of its vertices collinear, and the other three also collinear, the intersections of the opposite sides are collinear also—a special case of Pascal's theorem on a hexagon inscribed in a conic. Desargues (q.v.) in his *Essai pour les coniques* generalized the theorem of Pappus with respect to the quadrilateral. He showed that if a transversal cuts a conic and a quadrilateral inscribed therein, the product of the segments between either point of the conic and two opposite sides of the quadrilateral will have to the product of the segments between this point and the other two opposite sides, the same ratio as between the corresponding products when the other point of the conic is taken. The theory was extended by Pascal, who was a friend of Desargues, and later by Newton, Cotes, and Maclaurin. In more recent times Carnot and Poncelet have been among the foremost to elaborate the theory. To Carnot is due the introduction of negative lines in the theory of transversals, and the treatment of the subject as related to modern geometry. See CONCURRENCE AND COLLINEARITY, Ceva's and Menelaus's theorems being important examples of the theory of transversals.



TRAN'SYLVA'NIA (Hung. *Erdély,* from *erdö,* forest, the name corresponding to the Latin, *Transilvania,* beyond the forest; Ger. *Siebenbürgen*). A former grand duchy and crownland of Austria, since 1867 an integral part of the lands of the Hungarian crown. It occupies the southeastern corner of the Hungarian Kingdom, and is bounded by Rumania on the east and south. Area, 21,518 square miles (Map: Hungary, H 3). It is inclosed on the east and south by the great range of the Carpathian Mountains, which bends round at a right angle, the part extending east and west being known as the Transylvanian Alps. The interior is crossed by numerous spurs of the border chains, and has an elevated surface. Some of the valleys are remarkably fertile. The chief river, the Maros, an affluent of the Theiss, crosses the country from northeast to southwest. The southern part is traversed by the Aluta, an affluent of the Danube, which breaks through the Transylvanian Alps in the Red Tower Pass, while the northern part is drained by the Szamos, an affluent of the Theiss. Transylvania has a number of small mountain lakes and is rich in mineral springs. The region is famous for its scenery, and the mixture of nationalities, with the various costumes, adds greatly to its picturesqueness. The climate is generally mild in the interior, especially along the rivers, while in the mountain regions the winters are long and severe. In spite of its mountainous surface, Transylvania has a very productive soil. The chief crops are wheat, barley, rye, oats, flax, tobacco, and some industrial plants. Fruits and especially grapes are cultivated extensively. Stock-breeding is favored by the abundance of meadow land, and is carried on on a large scale. The local breed of horses is superior and many are exported. Wool is an important product. The mineral products in 1900 included 2260 kilograms of gold, 2574 kilograms of silver, and nearly 1,000,000 tons of coal. The total value of the mineral output was over $7,000,000, of which salt alone amounted to over $2,000,000. Wild game still abounds in the mountains and large forests, including bears, wolves, foxes, and boars. Transylvania is well provided with transportation facilities. The population was 2,251,216 in 1890 and 2,456,838 in 1900. About 56 per cent. of the inhabitants are Wallachs (Rumans), about 33 per cent. Magyars (Hungarians) and Szeklers (close kin to the Magyars), and about 9 per cent. Germans. The Germans represent mainly descendants of colonists brought into the country from the region of the Lower Rhine by King Gejza II. of Hungary about the middle of the twelfth century. They dwell mainly in the southern part of the country, the district inhabited by them being known as Saxon Land. Their chief town is Hermannstadt. The great bulk of the inhabitants of Transylvania belong to the peasant class. The nobility and gentry are Magyars. Of the population 30 per cent. are Greek Orthodox, 28 per cent. Greek Catholic, 24 per cent. Protestant, 13 per cent. Roman Catholic, 2½ per cent. Unitarians (Transylvania having become the cradle of modern Unitarianism in the sixteenth century), and 2 per cent. Jewish.

HISTORY. The largest cities of Transylvania are Klausenburg, which possesses a university, Krondstadt, Hermannstadt, and Maros-Vásárhely. Transylvania formed part of the Roman province of Dacia. When the great migration of nations took place it was for a time occupied by Germanic peoples. They were followed by the Avars, after whom came the Petchenegs. In the eleventh century the country was brought under the sway of the Magyars. The advent of German colonists in the twelfth century improved the condition of the country. It was probably not long after this that the immigration of Wallachs set in from the region now called Rumania. Under the Hungarian kings Transylvania was ruled by voivodes. In 1526, after the battle of Mohács, in which Louis II. of Hungary was overwhelmed by Solyman the Magnificent, the national party among the Hungarians chose John Zápolya, Voivode of Transylvania, King. He had a rival in Ferdinand I. of Hapsburg. Part of Hungary remained in possession of John Zápolya, who was upheld by the Turks. Transylvania was severed from the Kingdom of Hungary, the royal crown remaining in the possession of the Hapsburgs. From 1571 to 1576 the country had an able prince in Stephen Báthory, who in 1575 was elected King of Poland. Other princes of the Báthory (q.v.) family followed. At the beginning of the seventeenth century Transylvania was for a short time in the power of Austria, but in 1604 a great rising of the Protestants in the country and in Hungary took place under the head of Stephen Bocskay (q.v.), who was elected Prince of Transylvania in 1605, and in 1606 forced the Hapsburgs to recognize the liberties of the Hungarian Protestants. In the Thirty Years' War two princes of Transylvania, Bethlen Gábor (q.v.) and George Rákóczy (q.v.), figured among the champions of the Protestant cause. When Leopold I. of Austria, after the overthrow of the Turks at Vienna (1683), had made himself master of the heart of Hungary, he proceeded to secure possession of Transylvania. Prince Michael I. Apafi (q.v.) had to acknowledge the Austrian ruler as overlord of Transylvania, which was united with Hungary, and his son, Michael II., was forced to renounce his title for a money consideration. In the Peace of Karlovitz, in 1699, the Turkish Sultan recognized the sovereignty of Austria over the country. The Diploma of Leopold I., in 1691, had guaranteed to Transylvania its ancient privileges and customs. It was erected into a grand principality in 1765. In the Hungarian Revolution of 1848-49 Transylvania was the scene of terrible massacres of the Magyars by the Wallachs and of the victories and final defeat of General Bem (q.v.). In 1849 Transylvania was separated from Hungary, and made an Austrian crownland. In 1867 it was again united with Hungary.

BIBLIOGRAPHY. Bielz, *Handbuch der Landeskunde Siebenbürgens* (Hermannstadt, 1856); Reissenberger, *Das Grossfürstentum Siebenbürgen* (Vienna, 1881); Bergner, *Siebenbürgen* (Leipzig, 1884); Hauer and Stache, *Geologie Siebenbürgens* (Vienna, 1885); Gerard, *The Land Beyond the Forest* (London, 1888).

TRAP. A name commonly applied to dark fine-grained rocks such as diabase, basalt, and diorite, the components of which cannot be readily distinguished.

TRAPA (Neo-Lat., abbreviation of ML. *calcitrapa*, caltrop, from Lat. *calx*, heel + ML. *trappa*, snare, from OHG. *trappa*, *trapa*, AS. *træppe*, *treppe*, Eng. *trap;* so called from the four spines of some species, which thus resemble caltrops). A small genus of aquatic plants of the natural order Haloragiaceæ. *Trapa natans*, the water caltrops, is found in ditches and ponds in Southern Europe, and is grown in ponds in Holland. The floating leaves are rhomboidal, toothed, and smooth; those under water are cut into capillary segments. The fruit has four spines; the large, almond-like kernels are edible either raw or roasted, or in soups, and taste somewhat like chestnuts, hence the French name marron d'eau (water chestnut). Nuts of *Trapa bispinosa*, the Singhara nut, being starchy, are widely used as food in Cashmere, where they are made into cakes, etc. *Trapa bicornis*, by some botanists considered to be a form of *Trapa natans*, is much cultivated in China, for its edible fruit. Some botanists reduce all the species to one, with possibly several varieties.

CHINESE BUFFALO NUT (*Trapa bicornis*).

TRAPANI, trä′pȧ-nē. The capital of the Province of Trapani, Sicily, situated on a peninsula, on the northwest coast, 45 miles west by south of Palermo (Map: Italy, G 9). There are several fine churches with noteworthy sculptures and paintings, and palaces architecturally interesting. The lyceum has a picture gallery and a natural history collection. The special industries are connected with the working of coral, shell-cameos, marble, and alabaster. There are also ship-building yards, salt-works, fisheries, and an export trade in wine, fruits, olive oil, etc. The fine harbor, which is defended by a fort, is the scene of much commercial activity. Near the city is the ancient Annunziata pilgrimage church, with the famous statue of the Madonna of Trapani. Trapani, the ancient Drepanum and seaport of Eryx (q.v.), was fortified by the Carthaginians in the third century B.C. Here in B.C. 249 they defeated the Romans in a great naval battle. Eight years later, however, Trapani became a Roman colony. It was a royal residence in the Middle Ages. Population (commune), in 1881, 38,231; in 1901, 59,452.

TRAP-DOOR SPIDER. Any one of the large hairy tropical spiders belonging to the family Theraphosidæ, which make long tubes in the earth, lining them with silk and furnishing them at the entrance with a bevel-edged, hinged, accurately fitting trap-door made of alternate layers of earth and silk. The upper surface is covered with earth or gravel so as to completely disguise the entrance. The spider hides in the nest when not seeking its prey, and with some species a branch to the tunnel is built with a separate door.

The digging of the burrow, which is always on high sloping ground, is a very laborious task. The earth is loosened with the mandibles, and is carried away piece by piece supported by the mandibles and maxillæ. One observed by Moggridge took an hour to dig a hollow as large as half a walnut. A species common in the Southwestern United States (*Ctenitza Californica*) digs holes nearly an inch in diameter, and sometimes a foot in length. When the spider is on guard, holding the door down from inside by means of its mandibles and feet, it is impossible to raise the trap-door without tearing it. Experimenters at San Diego, California, removed the trap-doors of sixty nests, unhinging them at night. Without exception the spider had by morning completed a new door. Continued removal, however, resulted in a falling off in the quality of the successive doors owing to the failure of the spider's supply of silk. The fifth door made, by a single spider, was composed almost entirely of mud with hardly enough web to coat and hinge it. When the trap-doors were fastened down a side branch with a new door was always made over night with an opening near the original mouth.

The nests are generally built in pairs, but it is not known whether they are occupied by different sexes. The young hatch in the mother's burrow, and live there for a few weeks; then they leave the nest and begin small tubes of their own. The food of these spiders consists largely of ants and other crawling wingless insects. They have been known to eat earthworms and large caterpillars. The trap-door spiders of Southern Europe make thin covers which rest loosely on the top of the hole, but they are covered with leaves or something of the sort in order to disguise them.

Consult: Moggridge, *Harvesting Ants and Trap-Door Spiders* (London, 1873); Emmerton, *The Structure and Habits of Spiders* (Salem, 1878); McCook, *American Spiders and Their Spinning Work*, vol. iii. (Philadelphia, 1893).

TRAPEZIUM. A quadrilateral of which no two sides are parallel. See QUADRILATERAL.

TRAPEZOID (Gk. *τραπεζοειδής*, *trapezoeidēs*, shaped like a trapezium, from *τραπέζιον*, *trapezion*, trapezium, table, from *τράπεζα*, *trapeza*, table, from *τέτρα-*, *tetra-*, four + *πούς*, *pous*, foot + *εἶδος*, *eidos*, form). A quadrilateral two of whose sides are parallel. The parallel sides are called the *bases*. The area of a trapezoid is given by the formula $A = \frac{1}{2}(b + b')a$, where b and b' are the bases and a the altitude. See QUADRILATERAL.

TRAPP, JOHN (1601-69). A Puritan clergyman. He was born at Croome d'Abetot; graduated B.A. at Oxford (1622); was usher (1622-24), then headmaster of the free school at Stratford-on-Avon (1624-26); vicar of Weston-on-Avon, two miles from Stratford (1636-46); rector of Welford (1646-60); then went back to Weston, where he died. His fame rests upon his commentaries on the books of the Old and New Testaments, which furnish a specimen of Puritan Bible study at its best, and are often both witty and wise. They were issued in a collected edition in 1662 et seq., and reissued as *Commentary on the Old and New Testaments* (1865-68). Consult Spurgeon, *Commenting and Commentaries* (London, 1876).

TRAPPING (from *trap*, AS. *træppe, treppe*, OHG. *trappa, trapa*, trap, snare; connected with Ger. *Treppe*, flight of stairs, ladder, Goth. *trimpan*, MHG. *trumpfen, trampeln*, Ger. *trampeln*, Eng. *trample, tramp*). In its strict meaning, the taking of animals and birds by means other than the arrow, spear, or gun. The methods used in trapping may be divided roughly into four classes: (1) 'The pit,' 'the inclosure,' and 'the heavy deadfall,' for the largest animals, such as the bear and the lion, and 'the lighter deadfall' and 'snap trap' for smaller yet dangerous beasts such as wolves, foxes, and beavers. (2) The 'box trap,' the 'switch-up,' and various 'snap traps' and 'snares' for the lesser kinds of quadrupeds. (3) 'Nets' of various kinds with or without decoys and birdlime for birds. (4) Nets and baskets for fish.

'The pit' is a hole in the earth, lightly covered, and completely inconspicuous. It is placed where the game is likely to go voluntarily, or where it may be drawn, either by judicious beating or the employment of an enticing bait. The covering breaks through and the quarry is caught in the pit. The kind of animal so caught varies with the country; for instance, the Arabs trap lions in pits. 'The inclosure' is a space round which in Africa the heavy creeping vines from tree to tree have been woven together into rough hurdles, and in Asia the bamboo is similarly employed.

The 'heavy deadfall' is a pen about three feet wide, four feet deep, and five feet high, made of logs driven into the soil. Four heavy corner posts hold transverse logs, and the fall log. The principle of the trap is that when the bait is disturbed, say by a bear, a heavy log will fall upon the animal's back and crush its body against the lower log fixed across the front of the pen. In order to reach the bait the bear must enter the trap at least half way. A slight forward pull releases the lower end of the bait stick and causes the 'fall log' to drop. Sometimes the 'fall log' is a heavy slab set up on bait sticks. The 'box trap' is practically the deadfall, but instead of the log falling on the captive, the box lid falls down on the box's sides and end, and incloses the catch unhurt. Its advantage is that it can be placed anywhere, even in a tree. For 'the switch-up' a runway of the animal sought for is selected, and on either side of it, about six inches apart, a notched stick is driven projecting about eight inches above ground, with a cross piece resting on the notches. A spring sapling about five feet long is then driven into the ground near by and its springy head bent over the cross piece and fastened to it, after which a noose of brass wire is hung on it. The rabbit or other small animal hopping along the runway runs his head in the sliding noose, this grips his neck, and in his struggles he releases the cross piece, which lets the sapling spring back and up to its vertical position, and the captive is lifted off its feet and strangled. The steel spring trap is used universally for every kind of quadruped, from the bear to the rat. It is made of two jaws of toothed steel, which when open lie flat on the ground harmless, but when trod on or the bait in the centre of it disturbed, springs up and catches the unwary intruder in a grip from which there is no escape. Its use is avoided by the more merciful trapper, because it does not always kill, like the deadfall, and does not merely confine, like the box trap.

Fish are trapped in a variety of ways. Gill nets are spread from stake to stake across the channels or swims of the fish when they come up from the sea, like shad, into the estuaries in the spring to spawn. Their heads are caught in the mesh of the net where their fins will not go through, and from which they cannot go back. Other nets are set to catch fish migrating down from the fresh waters to the sea, like salmon and trout. Similar ones are sometimes set under the ice, near holes cut into it, toward which the fish will invariably come to breathe. Then there is the 'cast net,' a circular net with lead weights around its bottom edge, which when thrown and spread, by a twirl of the arm, into shallow water where a shoal of fish are, sinks rapidly at the full extent of the circle, and when drawn in by the caster pulls all the fish within its area up with it on to land. Baskets are set for some fish, such as eels, into which they can crawl, but out of which they cannot return. Snares, too, or snigs, as they are sometimes called, are used to capture fish in shallow water, notably pike. They are simply wire nooses at the end of a rod which the snarer quietly slips over the head of the fish and tightens with a snatch. The Chinese have an ingenious way of trapping fish. They attach a board along the side of a boat so that it descends into the water at a very slight angle. They paint this white and cover it with a shining iridescent varnish. Then, on a moonlight night, they propel the boat toward the shoal of fish, and the fish, mistaking the radiance of the board for that of the elements, swim up the shallow board, which is flush at the top with the gunwale, and over into the boat.

TRAPPISTINE. A liqueur made at the Trappist abbey of Grâce-Dieu, France. See Liqueur.

TRAPPISTS. A branch of the Cistercian Order, following the reforms introduced in 1664 by Jean le Bouthillier de Rancé (q.v.). They take their common name from the Monastery of La Trappe in Normandy, of which Rancé was abbot when he began his reforms. They are classed among the most austere of Roman Catholic religious Orders, and their very strictness and separation from the world has brought and still brings them many members who have held distinguished positions in secular life, but wish to leave it. The day in a Trappist monastery begins with matins in the church at 2 A. M., followed by a half hour's meditation, and mass or study occupies the time until ten minutes to six. Then follows prime, and from 7.30 to 9 manual labor or instruction. At 9.45, terce, high mass, sext, and examination of conscience. Dinner is at 11, except on fast-days, when it is an hour later. The hour after it is occupied by study in winter, but a nap is conceded in summer. Work or teaching come again from 2 to 4; vespers and meditation at 5, at 6 compline, at 7 supper, and bed at 8. The dinner consists of a small quantity of soup and vegetables with a pound of bread and a little fruit and one glass of beer. The supper is of a similar nature, and those who need it are allowed a little milk, coffee, or broth on rising. The fasting season lasts from Holy Cross Day (September 14th) until Easter. The Trappist sleeps in his habit, removing only his shoes. Only the superiors have separate rooms; each of the others has simply a curtained alcove in a large dormitory. Perpetual silence is the most characteristic restriction imposed on the Trappist monk. It is absolute, unless he has the care of guests, or needs to speak to his superiors; any other necessary communications are made by signs. When sick, he is nursed in the infirmary; dying, he is carried into the church that he may receive the last rites in the presence of his brethren. The dead are buried in their habits, without coffins. Novices are received after two years' probation, and three years later may be professed. Besides the choir-brothers, who are or mean to be priests, and the lay brothers, oblates are also received—persons who for some reason do not wish to take the vows, but conform strictly to the rule during their residence in the monastery.

The earlier houses of the Order were nearly all in France; their expulsion from that country at the time of the Revolution and under the Third Republic has caused them to plant numerous monasteries in other countries. According to official statistics, in 1897 they had 3472 members, in 54 monasteries. They have one house in England, two in Ireland, two in Canada, and two in the United States—at Gethsemane, Ky., and near Dubuque, Iowa. They do not as a rule undertake the cure of souls, but conduct a few mission stations in South Africa, the Congo State, Japan, China, etc. Consult: Gaillardin, *Les Trappistes* (Paris, 1844); *La Trappe par un Trappiste de Sept-Fons* (ib., 1870); Pfannenschmidt, *Geschichte der Trappisten* (Paderborn, 1873). For the ordinary reader, the most vivid and accurate account of life in a Trappist monastery is to be found in Huysmans's *En Route* (Eng. trans. by C. Kegan Paul, London, 1896).

TRAP-ROCKS (Ger. *Trapp*, from Swed. *trapp*, trap-rock, from *trappa*, Ger. *Treppe*, stair; so called because often developed in step-like masses). A very general term, little employed in scientific language, but commonly used to designate dense and generally fine-grained igneous rocks of black or dark-green color. The term is almost synonymous with basalt (q.v.) or diabase (q.v.), but might include, as well, gabbro, norite, peridotite, pyroxenite, etc. When altered such rocks assume a green color from the hornblende, chlorite, epidote, or other secondary minerals developed in them, and they are then known as greenstone. Both greenstone and trap include a wide range of rock families, which by reason of their fine texture and altered condition are difficult to determine without careful and generally microscopic study.

TRAQUAIR, trăk′wâr, Ramsay Heatley (1840—). A British naturalist, born at Rhynd, Perthshire. He graduated at Edinburgh University, and in 1873 was made keeper of natural history collections in the Edinburgh Museum of Science and Art. From 1883 till 1887, and again from 1896 till 1900, he was Swiney lecturer on geology in the British Museum. His publications include: *Structure and Affinities of the Palæoniscidæ* (Pal. Soc., 1877); *Structure and Affinities of the Platysomidæ* (*Trans. Roy. Soc. Ed.* 1879); and *Report on Fossil Fishes Collected by the Geological Survey of Scotland in the Silurian Rocks of the South of Scotland* (*Trans. Roy. Soc. Ed.* 1900).

TRASIMENO, trä′sê-mä′nō, Lago (Lat. *Trasimenus Lacus*), or Lago di Perugia. A lake in Italy, lying between Cortona and Perugia. It is about 10 miles in length by 8 in breadth; the greatest depth is not above 30 feet. The lake has no apparent outlet, and the margins are flat and overgrown with reeds. It is surrounded on all sides by hills, those on the north side, extending from Cortona to the lake, being known as the Gualandro Hills—the *montes Cortonenses* of Livy. They are covered at the present day with oaks, vineyards, and olive plantations. The lake is memorable chiefly for the great victory obtained by Hannibal in B.C. 217 during the Second Punic War, over the Romans, under Flaminius.

TRASS. See TRACHYTE.

TRASTEVERE, träs-tā'*ve*-r*e*. A district of Rome about the Janiculum, which was annexed to the city by Augustus as the *Regio Transtiberina.* In Imperial times it was the abode of street peddlers, and during the Middle Ages was frequented by foreigners. It is now almost entirely inhabited by the working classes. Many valuable antiquities have been recovered in the district, among them the Apoxyomenos (q.v.) of Lysippus.

TRAU, trou. A town of Dalmatia, Austria, on the Adriatic, 12 miles west of Spalato (Map: Austria, E 5). It is interesting for its remains of Venetian domination, including a thirteenth-century cathedral. Population of the commune, in 1900, 17,064.

TRAUBE, trou'b*e*, LUDWIG (1818-76). A German clinician, born at Ratibor, Silesia. He studied at the universities of Breslau and Berlin. In 1849 he became assistant of Schönlein in Berlin, and for many years was connected with the Charité Hospital there. In 1857 he was made professor at the Friedrich-Wilhelm Institute, and in 1872 he became professor at the University of Berlin. Traube was especially noted for his experiments on animals for the purpose of demonstrating pathological conditions. The practice of auscultation and percussion was greatly promoted by him, and he also made important studies regarding diseases of the heart, kidneys, and lungs. He published: *Beiträge zur experimentellen Pathologie* (1846); *Ueber den Zusammenhang von Herz- und Nierenkrankheiten* (1856); *Gesammelte Beiträge zur Pathologie und Physiologie* (1871).

TRAUMATROPISM (from Gk. *τραῦμα*, *trauma*, wound + *τροπή*, *tropē*, a turning, from *τρέπειν*, *trepein*, to turn). The sensitiveness of plant parts to wounding, by reason of which they change their growth so as to curve away from the side wounded. This sensitiveness is especially manifested by roots; in which, however, severe wounding may produce a purely mechanical effect, overpowering the true irritable reaction, which is only manifest in response to slighter wounds. See GROWTH.

TRAUN, troun. A river of Austria. It rises on the Gross-Hochkasten in Northwestern Styria and, entering Upper Austria, traverses the Hallstättersee and the Traunsee (q.v.) and flows into the Danube a few miles below Linz. It is celebrated for its trout. Near the village of Roitham it forms a notable waterfall. Length, about 110 miles.

TRAUNSEE, troun'zā, or **GMUNDENERSEE**, gmụn'den-ẽr-zā. The largest lake of Austria after the Attersee (Map: Austria-Hungary, C 3). It lies in Upper Austria, at an altitude of 1376 feet, between Ebensee and Gmunden in the Traun Valley, and is eight miles long and 626 feet deep. It is a picturesque lake and, after the Walschensee and some of the Italian lakes, the deepest in the Eastern Alps.

TRAUTENAU, trou't*e*-nou. A frontier town of Bohemia, situated 74 miles northeast of Prague, on the Aupa, a tributary of the Elbe (Map: Austria, D 1). It is the centre of the linen industry of the Riesengebirge, and has in addition paper mills. Here occurred two engagements between the Prussians and Austrians, June 27 and 28, 1866. Population, in 1890, 14,777.

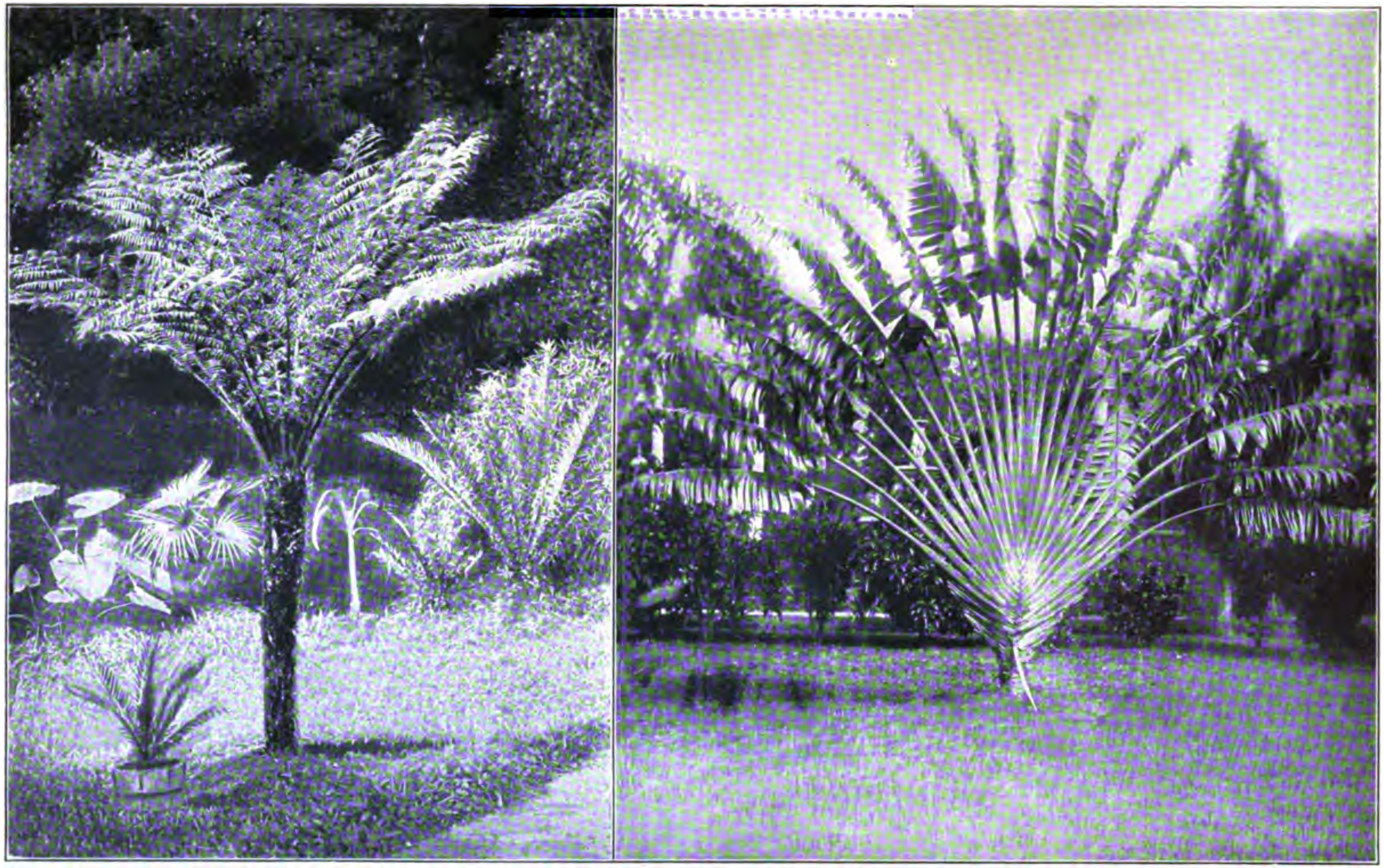
TRAUTWINE, trout'wīn, JOHN CRESSON (1810-83). An American civil engineer, born in Philadelphia, Pa. In 1828 he began the study of his profession in the office of William Strickland, then the principal architect and civil engineer of Philadelphia. He assisted Strickland in the construction of the United States Mint at Philadelphia, was a civil engineer on the Columbia Railway in 1831, became principal assistant engineer of the Philadelphia, Wilmington and Baltimore Railway in 1835, and an engineer of the Philadelphia and Trenton Railway in 1836. In 1836-42 he was chief engineer of the Hiawassee Railway, connecting Georgia and Tennessee. With G. M. Totten he constructed the waterway known as the Canal del Dique, between the Bay of Cartagena and the Magdalena River, and executed (1850) the surveys for the Panama Railway. Other surveys made by him include those for the Lackawanna and Lanesborough Railway (1856), and those for an interoceanic railway route across Honduras (1857). He also planned a system of docks for the city of Montreal.

TRAVAILLEURS DE LA MER, trȧ'vī'yẽr' d*e* lȧ mâr (Fr., Toilers of the Sea). A novel by Victor Hugo (1866), containing wonderful and sympathetic descriptions of the sea. The theme of the story is the desperate devotion of Gilliat for Deruchette, leading to his suicide.

TRAV'ANCORE'. A native State of British India, lying territorially within the Province of Madras (Map: India, C 7). It occupies the western part of the extreme southern end of the Indian peninsula, and stretches from Cape Comorin northward along the coast to Cochin. Area, 7091 square miles. The coast, which is low and sandy, is lined with lagoons receiving numerous small streams. The land rises gradually to the crest of the Anamalay Mountains, which extend along the eastern boundary with an average altitude of 4000 to 5000 feet, rising in their highest peaks to over 8500 feet. The climate is hot on the coast; the rainfall is heavy, and the mountain slopes are covered with forests of valuable woods, such as teak and ivory.

Rice, the sago palm, and vegetables are among the principal products. Pepper, coffee, tea, cocoanut products, and timber are the chief articles exported. Travancore is one of the most progressive of the native States of India. Its chiefs for a long period have been highly qualified by character and education for their positions, government has been well administered, and a higher degree of prosperity has prevailed than has been common in India. The chieftaincy descends in the female line. The ruling family belongs to the Hindu race. A tribute of 810,162 rupees is paid annually to the British in consideration of the protection which they afford. In 1897-98, 64 per cent. of the boys and 19 per cent. of the girls of school age were in attendance at schools. The total population increased from 2,557,736 in 1891 to 2,951,038 in 1901. The large majority of the population, 2,035,615, were Hindus. There were 190,566 Mohammedans and 28,183 Animistics. In few regions of India has Christianity secured so

TREE FERN AND TRAVELER'S TREE



TREE FERN

TRAVELER'S TREE

great a hold, the Christians numbering, in 1901, 697,387. Trivandrum (q.v.) is the capital.

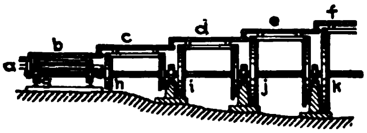
TRAVELER, THE. A poem by Oliver Goldsmith (1764), containing many familiar lines and descriptions of various countries.

TRAVELERS, LAW AS TO. See HIGHWAY; TICKET; CARRIER, COMMON.

TRAVELER'S JOY. See CLEMATIS.

TRAVELER'S TREE, or RAVENALA (*Ravenala Madagascariensis*). A remarkable plant of the natural order Musaceæ, a native of Madagascar, where it forms a characteristic feature of the scenery. The stem resembles that of the plantain, but sends out leaves only on two opposite sides, like a huge expanded fan. The lower leaves drop off as the stem grows, and in old trees they are sometimes 30 feet from the ground. A tree often has 20 or 24 leaves, the stalk of each leaf being 6 or 8 feet long, and the blade 4 or 6 feet more. The blade of the leaf is oblong, bright green and shining. The fruit is not succulent, but is filled with a brilliant blue or purple fine silky fibre, among which are about 30 or 40 seeds. Forty or fifty fruits grow in a bunch, and three or four bunches may be seen at once on the tree. The leaves are much used for thatch, and for many other purposes, and the leafstalks for the partitions, and often even for the walls of houses. The bases of the leafstalks usually hold water, even in the driest weather, more than a quart being readily obtained by piercing the thick part of the base. This water, which may be used for drinking in case of need, has suggested the name.

TRAVELING SIDEWALK. An arrangement for the transportation of passengers, consisting essentially of a series of parallel closely abutting platforms traveling on wheels or rollers at different speeds. A sidewalk of this character was installed at the Columbian Exposition at Chicago to convey passengers from one part of the grounds to another, and similar structures have been employed elsewhere. The principle of operation of the traveling sidewalk may be readily understood by an explanation of the accompanying diagram. In this diagram *a*, *b*, *c*, *d*, *e*, and *f* are the parallel platforms. The platform *a* is stationary, but the others all travel by means of flexible rails riding on the rims of the wheels *g*, *h*, *i*, *j*, and *k*. These wheels rotate on a common shaft at the same number of rotations per minute, but, being of different characters, they carry the superimposed platforms at different speeds; thus platform *b* has, say, a speed of 3 miles per hour, *c* a speed of 6 miles, *d* a speed of 9 miles, *e* a speed of 12 miles, and *f* a speed of 15 miles. The platforms travel continuously, and a foot passenger desiring to use them steps from the stationary platform *a* onto the moving platform *b* and then onto *c*, *d*, *e*, and *f* in succession; the return to the stationary platform is made in a similar manner, but, of course, in the reverse direction. By having the difference between the speeds of any two adjacent platforms no greater than the speed of a brisk walk the transition from one speed of travel to the next higher or lower is accomplished without difficulty, and the pedestrian can board and leave the moving platforms at any point he may choose. A traveling stairway is a similar arrangement placed on an incline, but supplied with but one moving platform. They have been used for ascending to elevated railway platforms and in large shops.



SECTION OF TRAVELING SIDEWALK.

TRAVEMÜNDE, trä′ve-myn-de. A town of Germany, the outport of Lübeck, lying nine miles northeast of that city at the mouth of the Trave (Map: Germany, D 2). It is a well-known watering place. The old walls of the town were torn down in 1882. Population, in 1900, 1849.

TRAV′ERS, JOHN (c.1707-58). An English musician and composer, born in London. He was a chorister in Saint George's Chapel, Windsor, and served in a like capacity at Eton College as occasion demanded. Owing to the good offices of Dr. Godolphin, the provost of Eton, he was later enabled to continue his studies in music under Dr. Green, the organist of Saint Paul's. His first appointment was as organist of Saint Paul's and conjointly with that of Fulham Parish Church (c.1725). In 1737 he became organist of the Chapel Royal, which appointment he held until his death. His service in F and such anthems of his as "Keep, We Beseech Thee," and "Ascribe Unto the Lord" are still included in the repertoire of English church music. His canzonets, 18 in number, the words of which were from the posthumous writings of Matthew Prior, bear evidence of a grace of melody which even to-day commands admiration, old-fashioned as they are in general construction. He was also the author of the celebrated *Whole Book of Psalms, for one, two, three, four, and five voices, with a thorough bass for the harpsichord.*

TRAVERSE. In common-law pleading, a denial of facts alleged in a pleading. See PLEADING.

TRAVERSE (OF., Fr. *travers*, from Lat. *traversus*, *transversus*, lying across, transverse, p. p. of *transvertere*, to turn across, from *trans*, across, through + *vertere*, to turn). A term in fortification, describing a cover or mask, constructed of earth in the same manner as the parapet of a redoubt. It is constructed in the interior of a redoubt, and is designed to protect the defenders from enfilade fire. In gunnery (q.v.) it describes the moving or pointing of a gun on its pivot, when taking aim, the gear by which the operation is accomplished being known as the traversing gear. The platforms by which heavy naval or fortress guns and carriages are moved into position, or by which their direction is changed, are called *traversing platforms*. See FORTIFICATION.

TRAV′ERSE CITY. The county-seat of Grand Traverse County, Mich., 60 miles northeast of Manistee; at the mouth of the Boardman River, on Grand Traverse Bay, an inlet of Lake Michigan; and on the Pere Marquette, the Grand Rapids and Indiana, and the Manistee and Northeastern railroads (Map: Michigan, H 4). It possesses an attractive situation and good fishing facilities, and enjoys considerable reputation as a summer resort. The Northern Michigan Insane Asylum is here. Traverse City is extensively engaged in manufacturing. It is known for its production of oval wood dishes and corn starch. Other important manufactures include baskets, lumber, interior finishings, farm implements, flour, leather, fur coats and robes, foundry and machine-shop products, etc. The government is vested in a mayor, chosen annually, and a unicameral council. The water-works are owned and operated by the municipality. Traverse City was settled about 1850 and was chartered as a city in 1895. Population, in 1890, 4833; in 1900, 9407.

TRAVERTINE (from It. *travertino, tiburtino,* from Lat. *tiburtinus,* travertine, relating to Tibur, from *Tibur,* an ancient town of Latium, now called Tivoli). A massive or crypto-crystalline variety of limestone that is deposited from springs or rivers, and usually has an irregularly banded structure owing to its mode of formation. A variety known as *calc tufa* consists of cellular depositions from the waters of small springs, and often contains fossil leaves, twigs, etc.

TRAVESTY (OF. *travesti,* p. p. of *travester,* to disguise, from Lat. *trans,* across, through + *vestire,* to clothe, from *vestia,* garment). A term applied in literature to denote a burlesque representation of something previously executed in a serious and lofty manner. It differs from parody (q.v.) in this respect: that while the latter changes the subject matter and the *dramatis personæ,* but mockingly imitates the style of the original, the former leaves the subject matter partially, and the *dramatis personæ* wholly, unaltered; producing a purely comic effect by the substitution of the mean, the frivolous, and the grotesque in action or speech, for the serious, the noble, or the heroic. See PARODY.

TRAV'IS, WILLIAM BARRETT (1811-36). An American soldier, born in Edgefield County, S. C. After studying law he began practice at Claiborne, Ala., about 1830. He removed to Texas, then beginning the struggle for independence, in 1832, and at once took part in the insurrection. He was made a colonel in the revolutionary army, and was captured by the Mexican forces, but was finally released. With about 150 men he defended the Alamo (q.v.) from February 23 to March 6, 1836, against General Santa Anna (q.v.) and about 5,000 Mexicans, and was killed just before the stronghold was taken.

TRAWLING (from *trawl,* from OF. *trauler, troller, troler,* Fr. *trôler,* to ramble, stroll, drag about; probably from MHG., Ger. *trollen,* to roll, run, and connected with Welsh *troell,* wheel, pulley, Bret. *trôel,* winding plant, *trô,* circle). One of two modes of deep-sea fishing, or of exploration of the depths. In Europe a 'trawl' or 'beam-trawl' is a triangular purse-shaped net, about 70 feet long, usually having a breadth of about 40 feet at the mouth. The upper part of the mouth is secured to a wooden beam which keeps the net open; this beam is supported on two upright iron frames, known as 'trawl-heads' or 'irons.' The under side of the net is made with a deeply curved margin attached to the 'ground-rope,' the whole length of it in contact with the ground. A trawl has also generally two pockets, one on each side, made by lacing together the upper and under parts, so that fish turning back from the cod may be caught in them. The meshes vary in size from four inches square at the mouth to an inch and a quarter square in the 'cod,' or narrow hinder end of the net. Two stout ropes about 15 fathoms long are fastened to the trawl-heads, and form a bridle, to which is shackled a towing-line 150 fathoms long. Trawling is generally in the direction of the tide, and can be followed with advantage only on a sandy bottom or other smooth ground. The vessels employed in trawling on the Dogger bank and elsewhere near the English coast vary in size from 35 to 60 tons. Many of these trawlers, however, stay out at sea for six weeks at a time in all seasons of the year, their fish being packed in ice, collected by fast-sailing cutters, and so conveyed to market. Cod, haddock, and similar fish are caught in great numbers by trawling; and some kinds of flat fish, as soles, are scarcely to be obtained by any other means. Smaller trawl-nets than those above described are used in bays and estuaries.

In the United States a 'trawl' is a long line anchored on the fishing ground, from which depends a row of short lines carrying baited hooks. The device is principally used on the fishing-banks. See DEEP-SEA EXPLORATION; FISHERIES.

TREACLE BIBLE. See BIBLE, CURIOUS EDITIONS OF.

TREACLE MUSTARD. See ERYSIMUM.

TREADMILL. A machine where the weight of men or animals acting on a series of treads or steps is employed to furnish power. The treads are so arranged on a cylinder or in an endless band that as a step is carried back under the weight of the operating man or animal, the latter is forced to move forward to the next in order to keep his footing. The most general application of this machine has been to farming machinery, where horses and dogs are used to supply the motive power. Such machines are employed for cutting hay or stalks, grinding and threshing grain, sawing wood, and in the case of the smaller machines for churning and similar light work. The endless band formed by the treads is inclined and is connected with a fly-wheel, to which the machinery to be operated is connected by belting. The term treadmill is most generally applied, however, to a device for carrying out a sentence of a prisoner to hard labor, which was formerly in general use in prisons in Great Britain. It consists of a wheel in the form of a long, hollow cylinder, with steps around its circumference and a hand rail above the wheel, so that a prisoner may support himself while treading the steps and thus working the wheel. The proper resistance may be created by means of weights, or the motive power thus created may be utilized to grind grain, etc. The physical exercise is severe, and the use of this form of prison discipline has been generally abolished. The *crank,* a small wheel with paddles, which revolves in a box partially filled with sand or gravel, has been generally substituted where unproductive hard labor is necessary. The number of revolutions of both a tread-wheel and a crank may be recorded by a dial, and a prisoner's labor thus regulated according to his physical condition. Neither device is in use in the United States.

TREAD'WELL, Daniel (1791-1872). An American inventor, born at Ipswich, Mass. Among his more important inventions are a power printing press; a system of turnouts for single-track railroads (1826); the Gypsey, a hemp-spinning machine for the manufacture of cordage (1829); and a method of constructing cannon from wrought iron and steel. Of these, the spinning machine was probably the most successful. In 1822, in conjunction with Dr. John Ware, he founded the *Boston Journal of Philosophy and the Arts;* and from 1834 to 1845 he occupied the chair of Rumford professor at Harvard. Consult *Memoirs of the American Academy of Arts and Sciences,* vol. xi. (Cambridge, 1888).

TREASON (OF. *traison, traisson, trahison,* Fr. *trahison,* treason; from Lat. *traditio,* surrender, delivery, tradition, from *tradere,* to deliver over, betray, from *trans,* across, over + *-dere,* Gk. *τιθέναι, tithenai,* Skt. *dhā,* to put, place). At common law there were two distinct classes of crime known as treason, termed respectively *high treason* and *petit treason.* The first was disloyalty to the sovereign or a violation of the allegiance due to him. The second was a violation of the allegiance due from an inferior to a superior, by taking the life of the superior, as of a wife to her husband, a servant to his master, or an ecclesiastic to his superior. Petit treason is now everywhere punished only as a homicide. High treason, being in effect treachery against the sovereign, was the highest crime which a subject could commit. By the ancient common law, however, the crime was not clearly defined; hence there was great latitude as to what was held by the judges to be treason, whereby, says Blackstone, "the creatures of tyrannical princes had opportunity to create abundance of constructive treasons, that is, to raise, by forced and arbitrary constructions, offenses into the crime and punishment of treason, which never were suspected to be such." Thus, the accroaching, or attempting to exercise, royal power (a very uncertain charge) has been treated as treason; and killing the King's father or brother, or even his messenger, has also been so treated. The inconvenience of these constructive treasons led to the passing of the statute of 25 Ed. III., c. 2, which attempted to define treason; and it was defined in five forms: (1) When a man compasses or imagines the death of the King, Queen, or their eldest son and heir. Under this clause it was held that the husband of a queen-regnant was not included; but it includes a king *de facto* without regard to his title. The phrase "compassing and imagining the death of a king" has been held to mean the mere purpose or design, as distinguished from the carrying such design into effect; nevertheless, the purpose can only be proved by some overt act, such as providing weapons or ammunition for the purpose of killing the King, or assembling and consulting on the means to kill the King, although such acts might fall short of the legal definition of an attempt. The law has often, however, been strained, and in those arbitrary times even a sermon unpreached was held to convict Peacham; and a paper found in a closet, to convict Algernon Sidney (1683), though merely speculative in its character. (2) Another form of treason was the violating of the King's companion (i.e. wife), or his eldest daughter unmarried, or the wife of the King's eldest son and heir. (3) Another form was that of levying war against the King in his realm either by taking arms to dethrone the King, or under pretense to reform religion or the laws; by resisting the King's forces; or by joining an insurrection. (4) It was also treason to adhere to the King's enemies in the realm by giving them aid and comfort, as by sending intelligence or provisions or selling arms to them. (5) Lastly, it was treason to slap the Chancellor, Treasurer, or the King's justices of the bench, or in assize, while in their places administering justice. Besides these specific forms of treason, the statute of Edward III. enacted that, if there should be other cases not above specified, the judge should tarry without going to judgment, till the King and Parliament should judge it treason or other felony—which was a safeguard against the judges indulging too much in refinements about constructive treason. At a later period, between the reigns of Henry IV. and Mary, the courts, nevertheless, returned to the practice of inventing constructive treasons, and included as such the clipping of money, burning houses to extort money, refusing to abjure the Pope, etc. These and other newly invented treasons were totally abolished by a statute of 1 Ed. VI., c. 12, but many of like nature were established under Elizabeth. A subsequent statute of 1 Anne, c. 17, provided that whoever endeavors to hinder the next in succession under the Act of Settlement from succeeding to the crown is to be held guilty of treason; and whoever maliciously affirms another to have right to the crown otherwise than according to the Act of Settlement, commits treason. Moreover, by 36 George III., c. 7, whoever compasses or intends death or bodily harm to the person of the King is to be adjudged a traitor. The act of 25 Ed. III., c. 2, was confirmed and made perpetual by 57 Geo. III., c. 6, which with the other statutes referred to embody the English statutory law upon the subject. There have been numerous statutes making certain specific acts treason, but most of these were repealed shortly after their enactment. All acting and abetting in the commission of treason are principals, there being no accessories in the crime of treason. See Principal; Accessory.

A copy of an indictment for treason and a list of the witnesses and jurors, together with the addresses of the latter, must be delivered to the prisoner ten days before the trial; and he is entitled to have counsel assigned to defend him. This right, which prisoners accused of other crimes have not in English law, was conferred by a statute of Will. III.

The punishment for treason was the most severe and revolting of the harsh punishments imposed by the common law. The traitor was to be drawn on a hurdle to the place of execution, hanged by the neck, his head then severed from the body, the body divided into four quarters, and the head and quarters to be at the disposal of the Crown. But in 1870 these barbarities were abolished, and the penalty is now changed to execution by hanging. The consequence of a conviction of treason was also forfeiture (q.v.) and corruption of blood, the corruption of blood having the effect that the attainted person could neither inherit lands from his ancestors nor transmit them to any heir. But this was altered as regards England and Ireland in 1870 by the statute 33 and 34 Vict., c. 23. The convict suffers forfeiture and is disqualified for any public office; the court may order him to pay the costs of his conviction, and his whole property is transferred to administrators named by the Crown, who administer it and retransfer the surplus to his heirs and representatives.

There are certain minor offenses which are called misprision of treason, being those closely bordering on treason. (See Misprision.) Such are offenses which consist in the bare knowledge and concealment of treason, without any degree of assent thereto, for any assent makes the party a principal traitor. The punishment of misprision of treason was loss of goods and lands during life.

In the United States treason may be either against an individual State or against the United States. In the former case it may be an offense at common law, although the Constitution or statutes of most of the States define the crime and provide a punishment. Most of these provisions, however, are modeled after the provisions of the United States Constitution defining treason. The Constitution of the United States (Art. 3, sec. 3) provides that treason against the United States shall "consist only in levying war against them, or in adhering to or giving aid and comfort to their enemies." It is further provided that no person shall be convicted of treason unless on the testimony of two witnesses to the overt act or upon confession in open court. The penalty is death or imprisonment and fine at the discretion of the court. Levying war within the meaning of this provision must be a defiance of public government by armed force, and must amount to more than a mere riot or an interference with the execution of the laws for some private purpose. The acts of the defendant must also proceed beyond mere preparation, as by enlistment of men for military service. They must meet or be assembled for a treasonable purpose and some act done toward executing with force their purposes. Thus an assembly of men arrayed in a military manner for the purpose of overawing the public and finally assailing the Government is levying war upon the Government, although no actual blow is struck. Adhering to or giving aid and comfort to the enemies of the United States means more than mere sympathy with enemies of the Government; it must be the voluntary giving of actual assistance to those who are waging war against the United States.

Most of the State Constitutions contain provisions similar to the clause of the United States Constitution, defining treason against the State and providing a punishment. Generally they provide that treason against a State may be committed by armed opposition to its laws or by forcibly attempting to overthrow or usurp the Government. In practice, the common law of crime and the statute law of crime in the several States have been found adequate to punish crime of a treasonable nature without resorting to prosecution for treason, and there have been few prosecutions for the specific offense of treason against a State. See Attainder; cf. Præmunire.

TREASURE ISLAND. A romance of adventure by Robert Louis Stevenson (1883). Though intended for boys, it first attracted the attention of the general public to his work.

TREASURER, Lord High. Formerly, the third great officer of the Crown in England, who was sole head of the King's exchequer. The office was originally held by one person, but in 1612 James I. put it in commission; and from the accession of George I. (1714) down to the present time, it has been the practice to vest the office in a board of Lords Commissioners of the Treasury.

TREASURE-TROVE (*treasure*, from OF. *tresor*, Fr. *trésor*, It., Sp. *tesoro*, from Lat. *thesaurus*, from Gk. *θησαυρός*, treasure, treasure-chest, storehouse, from *τιθέναι*, *tithenai*, to put, place + *trove*, from OF. *trover*, *trouver*, Fr. *trouver*, to find). In the common law of England, hidden treasure of gold, silver, and bullion accidentally found in the earth, the owner of which cannot be ascertained. Treasure-trove belongs to the Crown, and in certain districts the right to claim it has been granted to the nobility. In order to come within this rule, the treasure must be concealed, as distinguished from that which is casually lost and remains on the surface, as to which a different rule applies. A finder of treasure-trove is bound by law to give notice of his discovery to the proper officials of the Crown, and his failure to do so may subject him to fine and imprisonment. However, the present policy of the English Government is to allow a finder to keep treasure thus discovered, less a small percentage of its value to be paid to the Crown, unless it is of some value as an object of historical or antiquarian interest, in which cases it is claimed by the Crown in order to be preserved in the national museums. By the Treasure-Trove Act of India the finder may keep it if no owner is found, in which case the latter is entitled to three-quarters and the finder to one-quarter of its value.

Although there are some *dicta* to the effect that the common law as to treasure-trove applies in the United States, the right is seldom, if ever, enforced, if it exists. See Finding.

TREASURY, Department of the. The executive department of the Government of the United States controlling the national finances. It was established by act of Congress in September, 1789, and was the successor of the Treasury Department created by the Congress of the Confederation in 1781, of which Robert Morris was for a time superintendent. It is the most extensive and complex of the executive departments and in rank stands next to the Department of State. It is presided over by a Secretary appointed by the President, who is a member of the Cabinet (salary, $8000), and second among the Cabinet officers in the line of succession to the Presidency. The department as originally established consisted of a Secretary, a Comptroller, an Auditor, a Treasurer, a Register, and an Assistant Secretary, together with a few clerks. From this small beginning the department has grown to be a vast establishment employing some 5000 persons at Washington with numerous bureaus, branches, and offices throughout the country. The only qualification for the office of Secretary of the Treasury is the negative one that he shall not be interested in foreign commerce. He is required to digest and prepare plans for the revenue and public credit; to prescribe the forms for keeping the public accounts; to superintend the collection of the revenues; to grant all warrants under certain limitations for moneys issued from the Treasury in pursuance of appropriations made by law; and, in general, to perform all such duties relative to the finances of the United States as shall be required by law. Simultaneously with the development of the country the duties of the department have been extended to the management of the national debt, the supervision of the national banks, the internal revenue system, the legal-tender currency, the merchant marine, the lighthouse system, the life-saving and marine hospital services, the Coast Survey, etc. The Secretary is aided by three Assistant Secretaries. The business of the department is distributed among the following offices and bureaus: the Comptroller of the Treasury, six Auditors, the Treasurer, the Register, the Comptroller of the Currency, the Commissioner of Internal Revenue, the Mint, the Bureau of Engraving and Printing, and the Marine Hospital Service.

The Comptroller of the Treasury, since 1894, has been aided by an Assistant Comptroller. He exercises a kind of supervisory power over the auditors, countersigns warrants drawn by the Secretary of the Treasury, etc. The original act creating the Treasury Department provided for a single Auditor; four additional Auditors were provided in 1817, and a sixth was added in 1836. The six Auditors are assigned to the Treasury, War, Interior, Navy, Post-office, and State and other departments respectively, with the duty of examining accounts. The Treasurer is charged with the duty of signing the paper currency and of receiving and keeping the moneys of the United States and with disbursing the same on warrants properly drawn and countersigned. There are Assistant Treasurers at New York, Boston, Saint Louis, Philadelphia, New Orleans, Baltimore, Cincinnati, Chicago, and San Francisco. The Register signs all stocks and bonds and all Treasury notes and coin certificates issued under the authority of the United States. The Comptroller of the Currency enforces the provisions of the national banking laws and superintends the issue of bank-note currency. At the head of the Bureau of Internal Revenue is a commissioner who is charged with the enforcement of the internal revenue laws and the collection of the internal revenues. He is aided by a collector in each revenue district. For the collection of the customs there is a collector in each district, a surveyor in the larger parts, and a general board of appraisers to hear appeals against decisions of the collectors with regard to the dutiability of imported goods. The Director of the Mint has the supervision of all mints and assay offices throughout the country and makes annual reports to Congress on the coinage of the country, the yield of precious metals, etc. The Bureau of Engraving, established in 1874, has charge of the preparation of designs, stamps, bank notes, bonds, Treasury drafts, and other securities of the United States. The Solicitor of the Treasury has charge of all legal measures to prevent the evasion of the revenue laws and the counterfeiting of the coin and other securities of the United States.

TREASURY NOTE. A certificate of credit issued by the Treasury Department on the authority of the Government and made receivable for government dues. In the United States, treasury notes bearing interest were issued at different times before the Civil War, but it was during that struggle that the financial necessities of the Government first led to the issue of very great quantities of non-interest bearing treasury notes, which, however, were made legal tender for all public and private debts except duties upon imports and interest on the public debt. See MONEY.

TREAT, ROBERT (1622-1710). A Colonial Governor of Connecticut, born in England. He emigrated to America with his father, and settled in Wethersfield, Conn. In 1639 he settled in Milford, from 1653 to 1659 was a deputy, and from 1659 to 1664 was an assistant. He opposed the union of the Connecticut River and New Haven settlements, and went with the dissatisfied faction which founded Newark, N. J. In 1672 he returned to Milford, and later distinguished himself in King Philip's War. In 1676 he was chosen Deputy Governor of Connecticut, and in 1683 was elected Governor, and with the exception of the two years in which the colony was under Sir Edmund Andros (1687-89), served until 1698. From the latter year to 1708 he was again Deputy Governor.

TREATIES, INDIAN. The first step of the United States Government in determining its policy in regard to the Indians, whether expressed or implied, was to decide as to the nature of their territorial rights, this being the chief and altogether the most important factor in their relations with the whites. The decision reached on this point is distinctly stated by the United States Supreme Court in the case of Johnson and Graham's lessee *v.* McIntosh (8 Wheaton, 453 et seq.), as follows: "It has never been contended that the Indian title amounted to nothing. Their right of possession has never been questioned. The claim of the Government extends to the complete, ultimate title, charged with the right of possession, and to the exclusive power of acquiring this right." The next step was to determine the branch of the Government to carry out this policy. By the ninth of the Articles of Confederation it was declared that "the United States in Congress assembled have the sole and exclusive right and power of regulating the trade, and managing all affairs with the Indians not members of any of the States."

It is evident, therefore, that while acting under the Articles of Confederation the right of managing and controlling the relations with the Indians resided in Congress alone. When the Constitution was framed this authority was conferred upon the legislative department in the following brief statement: "To *regulate commerce* with foreign nations and among the several States, and with the *Indian tribes.*"

It is apparent, from the use of the term 'tribes,' that the framers of the Constitution had in contemplation the method of dealing with the Indians as tribes through treaties. This is clearly shown by the act of March 1, 1793, in which it is stated that no purchase or grant of lands from the Indians shall be of any validity "unless the same be made by a treaty or convention entered into pursuant to the Constitution." This action of Congress necessarily placed the initiatory steps in dealing with the Indians under the jurisdiction of the President as the treaty-making power, subject to confirmation by the Senate.

The colonies and also the mother country had treated with the Indians as 'nations,' their chiefs or sachems often being designated as 'kings'—and this idea, being retained by the founders of our Government, was ingrafted into their policy. It must also be remembered that the colonies then were weak, and that the Indian tribes were comparatively strong and capable of requiring recognition of equality. Notwithstanding the evident anomaly of such a course, the growth in numbers and strength of the whites, and the diminishing power of the natives, this implied equality was recognized in the dealings between the two until the act of March 3, 1871. During all this time Indian titles to lands were extinguished only under the treaty-making clause of the Constitution; and these treaties, though the tribe may have been reduced to a small band, were usually clothed in the same stately verbiage as the most important treaty with a great European power.

It was ordered by this act of March 3, 1871, that "No Indian nation or tribe within the territory of the United States shall be acknowledged or recognized as an independent nation, tribe, or power with whom the United States may contract by treaty," thus terminating a legal fiction which had been kept up for nearly a hundred years. It appears from the annual report of the Commissioner of Indian Affairs for 1890, that the Indian title to all the public domain had been extinguished except in Alaska, in the portions included in 162 reservations, and those acquired by the Indians through purchase. As the title to reservations is derived in most cases from the United States, and title by purchase is derived directly or indirectly from the same source, it may be stated that the Indian title to all the public domain, except in Alaska, had practically been extinguished by the year 1890. It would seem, in fact, that the United States Government proceeded on the theory that *all* the lands within its bounds were held by the natives, and hence that their possessory right must be extinguished. The only known variation from this rule was in the case of the Uintah Utes, where an omitted portion of their claimed territory was taken possession of without agreement. From the formation of the Government up to March 3, 1871, 653 treaties were made with 97 different tribes or recognized tribal organizations.

A natural corollary of land cessions by the Indians to the United States Government was the establishment of reservations for these natives either within the limits of the original territory or elsewhere. These reservations, which up to March 3, 1870, were usually determined by treaty or agreement, were the restricted areas to which the Indians were confined in order to bring them more directly under the control and care of the Government, and to lessen the liability of conflict with the whites and warring between the tribes. It was hoped also that by thus curbing the wandering habit these reservations might become, by the fostering hand of the Government, the first step toward civilization. This policy, which has been also followed in Canada under both French and English control, was inaugurated by the Government as early as 1786, and continued as an established policy to the present day. The earliest reservations were chiefly formed as the direct result of the cession of lands by the tribes, thus restricting their limits, but expressly stating in the treaty defining the bounds that the portion so limited was 'allotted to' or 'reserved for' the given Indians. Up to 1890 162 of these reservations had been established. The method of establishing reservations has not been uniform, some being by treaty, some by executive order, and others by act of Congress. Those established by executive order, independent of the act of Congress, were not held to be permanent before the General Allotment Act of 1887, under which the tenure has been materially changed, and all reservations, whether by executive order, act of Congress, or treaty, are held permanent. Reservations by executive order under authority of an act of Congress are those which have been authorized or established by acts of Congress and their limits defined by executive order, or have been first established by executive order and subsequently confirmed by Congress.

Other respects in which the power of Congress intervenes in reference to Indian lands, or is necessary to enable the Indians to carry out their desires in regard thereto, are the following:

(1) Allotments of land in severalty previous to the act of February 8, 1887, could be made only by treaty or by virtue of an act of Congress, but by this act general authority is given to the President for this purpose.

(2) Leases of land, sale of standing timber, granting of mining privileges and right of way to railroads are all prohibited to the Indians without some enabling act of Congress. On the other hand, it is obligatory on the Government to prevent any intrusion, trespass, or settlement on the lands of any tribe of Indians except where their consent has been given by agreement.

TREATY (OF. *traite*, *traicte*, Fr. *traité*, It. *trattato*, treaty, from ML. *tractatus*, treaty, agreement, from Lat. *tractare*, to treat, manage, frequentative of *trahere*, to draw, drag). A compact or agreement entered into between the governments or sovereigns of two or more States. A treaty is somewhat analogous to a contract in private law, the main differences being in the origin, purpose, and manner of enforcement. Thus a treaty is concluded with more formality than a private contract, its purposes are usually of a public character, while its enforcement rests chiefly upon the good faith of the contracting parties. The right of entering into treaty relations is one of the essential attributes of sovereignty, and is therefore not usually permitted to so-called dependent States except under certain restrictions, nor to the component members of States having the federal system of government. So-called dependent States frequently retain the right of making commercial and extradition treaties, postal and customs conventions, and sometimes treaties of alliance and of naturalization. Component members of confederate States usually retain a considerable degree of treaty-making power, as, for example, the members of the German Bund of 1815-66 or the States of Argentina (q.v.). Under the present German Empire the individual States enjoy the power to make treaties only with their immediate foreign neighbors, and only concerning postal and telegraph communication across the boundary between them. The Commonwealths of the United States are expressly forbidden to enter into treaty relations with foreign States or to make agreements among themselves except with the consent of Congress. The treaty-making power of a country is determined by its Constitution. In the United States it is vested in the President, acting by and with the advice and consent of the Senate, two-thirds of the members concurring. The President exercises this power through the Department of State or through special plenipotentiaries appointed for the purpose. In monarchical countries the treaty-making power is usually a prerogative of the Crown, but an indirect influence is frequently exercised by the legislature, especially when an appropriation of money is necessary to carry into effect the stipulations of the treaty. In the German Empire treaties which relate to any subject already regulated by Imperial law require the approval of the legislature. In the French Republic the President is empowered to negotiate treaties; but if the treaty is one of peace or commerce, or involves the finances or the territory of the State, or relates to the personal or property rights of Frenchmen in foreign States, the approval of the two Chambers is necessary. With the few exceptions of this kind, the negotiations and ratification of treaties in the European States are in the same hands, but they are distinct and separate steps, and ratification may be withheld after the treaty has been negotiated. Everywhere formal ratification is essential to the validity of a treaty.

In the United States, where the negotiating and ratifying authorities are in different hands, the question of ratification assumes a double importance, for it by no means follows that ratification is a matter of course. In several notable instances treaties negotiated by the President have been rejected by the Senate. Foreign governments, therefore, negotiating with the President of the United States are presumed to know that negotiation is only the initial stage in the procedure. The Senate has, moreover, claimed the right, and has exercised it in several instances, of ratifying only a part of a treaty instead of sending it back as a whole for revision. An important question has arisen in the United States as to whether Congress is bound to enact the necessary legislation to carry into effect the stipulations of a treaty negotiated by the President and duly ratified by the Senate. This question first arose in 1794 in connection with the unpopular Jay Treaty which called for an appropriation of money to carry it into effect. The House of Representatives was at first inclined to refuse its concurrence, and only gave in after a sharp struggle, and then by a very close vote. It is impossible to say even now that the question has been decided one way or another. The rule now is to lay reciprocity treaties before Congress for its approval and for the enactment of the necessary legislation to carry them into effect. This practice has been followed in the case of reciprocity treaties with Mexico, Canada, and Cuba.

The question has also been raised as to how far the Government is bound by the action of its negotiator provided he has not exceeded his instructions. Formerly the rule prevailed that if the plenipotentiary acted in accordance with his *full power* his principal was bound by his action, since the knowledge of the full power by the other party was a motive which induced him to negotiate. Some writers, following the doctrines of the Roman law, still hold that the principals are in good faith bound by the acts of their duly authorized plenipotentiaries. Others make a distinction in this respect between treaties proper and contracts, holding that, in view of the magnitude of the interests involved in agreements between States and the possibility of errors of judgment or of policy on the part of negotiators, a right of examination and of rejection is indispensable. It is now universally conceded that the principal may withhold his ratification from treaties negotiated strictly in pursuance of instructions where it is found to be impossible from physical or other reasons to fulfill their stipulations, or on account of mutual error by which both parties were misled, or where a change of circumstances upon which the validity of the treaty was made to depend has occurred, or where ratification of the treaty would involve injury to a third party.

The extent of the treaty-making power unless restricted by the Constitution is almost unlimited. It includes the acquisition of foreign territory; the disposal of domestic territory; the recognition of new States; the creation of servitudes; the formation of alliances; the granting of special privileges with respect to trade, commerce, and residence; the delimitation and rectification of boundaries; the guarantee of territorial integrity; the neutralization of ship canals, etc., etc. It is a common provision in European constitutions to restrict the treaty-making power with regard to the cession of domestic territory by requiring the approval of the legislature in such cases. A constitutional question has been raised in the United States as to whether the treaty-making power extends to the alienation of land belonging to a State, and on this point constitutional lawyers differ in opinion, but the better view seems to be that where doubt exists as to the right of a State to land which it claims the disputed territory may be ceded by treaty. On the other hand, it is contended that land to which the right of the State is undisputed cannot be disposed of without the consent of the State except in case of conquest, where transfer is inevitable as a means of terminating the war.

The usual conditions essential to the validity of a treaty are, first, that the contracting parties shall possess the requisite capacity for entering into treaty engagements. Thus, neutralized States like Belgium and Switzerland are lacking in the capacity to enter into treaties which contemplate the waging of offensive war. In the second place, the plenipotentiaries who negotiate the treaty must be properly authorized. In the United States the President rarely if ever participates directly in the negotiations. This duty generally devolves upon the Secretary of State, although not infrequently the work is intrusted to a minister resident or to a special plenipotentiary or commissioner. Agreements entered into in excess of their authority are invalid and ratification may be withheld. An unauthorized agreement is called a *sponsion* and is of no effect unless approved by the sponsor's Government. The third essential to the validity of a treaty is freedom of consent on the part of the signatory powers. If either part acts under constraint the resulting agreement is void except in the case of treaties or other agreements arising in the course of war, where from the nature of the case the element is present. But an error as to the value of a consideration such as may result from imperfect geographical knowledge with regard to a boundary will not affect the validity of the treaty. Finally, treaties which stipulate for the execution of objects which are physically impossible of execution, which are repugnant to the usages of international law, or which conflict with previous engagements with other powers are held to be invalid. Thus treaties stipulating the establishment of slavery, assuming joint control over a portion of the high seas, or impairing the sovereignty of a third power would be invalid.

Treaties are susceptible of classification along different lines. Vattel classifies them as equal and unequal, or those in which the reciprocal considerations are equal and those in which they are unequal; personal treaties, which expire with the death of the sovereign who contracts them; and real treaties, which bind the State permanently. De Martens follows the same arrangement, but adds transitory conventions and mixed treaties. Calvo distinguishes treaties, with reference to their form, into transitory and permanent; with reference to their nature, into personal and real; with reference to their effects, into equal and unequal and simple and conditional; and, finally, with reference to their objects, into treaties of guarantee, commerce, neutrality, alliance, etc. Hall arranges them as follows: (1) those which are declaratory of the law as understood by the contracting parties; (2) those which stipulate for practices which the contracting parties wish to incorporate into the usages of law, but which they know to be outside the actual law; (3) those which are, in fact, mere bargains, in which, without any reference to legal considerations, something is bought by one party at the price of an equivalent given by the other.

Cartels, capitulations, and suspensions of arms, or truces, are sometimes involved in the classifications of treaties, although strictly speaking they are not treaties. Transitory agreements or conventions are treaties which contemplate the immediate execution of the stipulations and which are complete when this act has been performed. Examples are treaties of delimitation, of cession, etc. Permanent treaties are those which are continuous in effect, either perpetually or for a specified period. Such are treaties of amity and commerce, of neutrality, of extradition, postal and customs conventions, etc. Cartels are agreements entered into in time of war between the commanders of opposing armies for the purpose of effecting an exchange of prisoners, and they may be transitory or for the period of the war. Capitulations are similar agreements for the surrender of a place, fleet, or army. Every general commanding is presumed to have authority to enter into agreements of this kind subject to any restrictions that may be imposed by the authority of his own State.

A treaty of alliance is an agreement between two or more States with a view to concerted action for a certain purpose. It may be temporary or permanent, equal or unequal, and offensive or defensive or both. Defensive alliances are usually formed with a view to preventing armed aggression against either party while offensive alliances are formed for the purpose of waging war against another State or States. A good example of the first class was the treaty of 1778 between the United States and France, while the alliances formed among various European States to curb the ambitions and aggressions of Louis XIV. and Napoleon I. were in form examples of offensive alliances, although defensive in character. Treaties of guarantee are entered into for the purpose of securing the observance and execution of already existing treaties or for the maintenance of certain existing conditions for a limited period or in perpetuity. Among the conditions which have been made the subject of guarantee may be mentioned the independence and territorial integrity of States, as, for example, Greece in 1832, and the Ottoman Empire in 1856; the neutralization of States, as in the case of Belgium and Switzerland; the neutralization of ship canals, as in the case of the Suez and proposed Panama canals; the free navigation of rivers; and the payment of State debts.

What are known as reciprocity treaties have been the subject of frequent negotiations in recent years, on account of the increasing importance of international commercial relations. Such treaties provide for reciprocal commercial advantages, usually in the form of reduced customs tariffs on the products of each State when imported into the other. They are usually entered into for limited periods of time. and are sometimes subject to revision at stated periods. It is generally held that the special privileges granted by reciprocity treaties cannot be claimed by other States having treaties which entitle them to privileges allowed to the most favored nation, the latter class being regarded in the light of contract obligations. Treaties of peace resemble ordinary treaties in form and in substance, but differ from them as regards the position of the contracting parties, since the element of duress is usually present in the negotiations, and hence freedom of conduct is not one of the requisites to the validity of such treaties. See WAR.

As regards the preparation of treaties, it has already been said that the ordinary method of negotiation is by a regular agent or commissioner. During the nineteenth century, however, the preparation of a number of the most important European treaties has been intrusted to general international congresses or conferences composed of ambassadors and in some cases of the sovereigns of the States concerned. Such were the Congress of Vienna of 1815 called to settle the questions growing out of the Napoleonic wars; the Congress of Aix-la-Chapelle in 1818, which terminated the military occupation of France; the congress at Paris in 1856, which effected a partial settlement of the Eastern Question at the close of the Crimean War and drew up a declaration relative to the usages of maritime warfare; and the Congress of Berlin of 1878 in respect to the questions growing out of the war between Turkey and Russia.

The language employed in the preparation of treaties was formerly Latin. Toward the close of the seventeenth century it was replaced by French, which is now the general diplomatic language of Europe and America. Each signatory power may insist upon the use of its own language, in which case a copy is prepared for each State in its own language and is usually arranged in parallel columns. Two States having a common tongue naturally employ that language. With regard to the form it may be said that no fixed rule prevails except that the stipulations of the treaty are usually preceded by a recital of the names and titles of the negotiators, with a statement of the purposes which the treaty is intended to accomplish. The treaty is divided into articles and clauses, ending with the terms of ratification and the signatures of the negotiators. A copy is prepared for each contracting party and the signatures follow, usually according to the principle of the *alternat*—that is, the plenipotentiary from each State signs first the copy intended for the use of his own Government. After the act of ratification by each of the parties there follows the formal exchange of ratifications, when the operation of the treaty begins. Treaties sometimes contain provisions for the accession of third parties. Such were the Declaration of Paris in 1856, the Geneva Convention of 1868, and the Treaty of Washington of 1871.

Treaties are terminated in various ways. They cease to be binding with the mutual consent of the parties thereto; or with the denunciation of either party if that right has been reserved; when the object of the treaty has been attained, as in the case of a boundary treaty, an arbitration treaty, or convention for the settlement of claims; when the operation of the treaty is conditioned upon terms which no longer exist, as in the case of a treaty allowing free navigation on a river which has ceased to be navigable; and when either party refuses to perform mutual stipulations. In the latter case the other party may consider itself released from its obligations, or it may demand a fulfillment of the treaty and require an indemnity for injuries resulting from any infractions thereof. By the usages of international law the refusal of either party to abide by a treaty, however burdensome, is a sufficient cause of war, since, as in the case of an ordinary contract, it is binding upon both parties until mutually abrogated. Finally, it is to be said that a treaty is terminated when the state of things contemplated by the parties and hence its real basis no longer exists. Thus a treaty is entered into in contemplation of the continuance of a particular form of government which in the course of time is displaced by another. Or the basis of the treaty may be changed by the absorption of one State by another, as in the case of Algeria, a State with which the United States had a treaty previous to the French conquest begun in 1830. Similarly the establishment of the German Empire in 1871 put an end to the treaties between the United States and the several German States with which she had entered into treaty relations. When a State is destroyed or loses its national character by other means its treaties fall to the ground, but ordinarily a mere change in the form of government will not affect its obligations to other States. In case of war between the contracting parties all treaties are suspended while certain of them are terminated. Treaties stipulating for a permanent arrangement of territorial and other national rights are at most simply suspended during the war and revive at peace. Such are treaties which recognize within certain territorial limits the independence of one of the contracting parties; treaties which establish new rules or modify old rules of international law, such as the Declaration of Paris of 1856; and treaties which contemplate a state of war and which come into effect only at the outbreak of hostilities, such as treaties of alliance and treaties which regulate blockades, and define contraband of war, regulate rules of capture, etc. Treaties of commerce and navigation and postal conventions are usually extinguished by war.

Sir Travers Twiss says that Great Britain in practice admits of no exception to the rule that all treaties as such are put an end to by subsequent war between the contending parties. In pursuance of this rule the treaties of Westphalia and Utrecht were several times reversed by the signatory powers after they had engaged in war with one another. A notable diplomatic discussion between Great Britain and the United States arose after the War of 1812 over the question of whether the treaty of 1783, in so far as it granted to the colonists fishery rights at Newfoundland, was suspended by the subsequent war between the contracting parties. The United States claimed that the treaty provision in question was not extinguished, it being the recognition of a preëxisting right which the colonies had always enjoyed in common with the mother country. Great Britain claimed, on the other hand, that the permission to fish on British coasts was in the nature of a grant of a special privilege and therefore terminated by the war.

As in the case of private contracts, certain rules for the interpretation of treaties have grown up. Phillimore arranges the rules of interpretation under three heads: (1) Authentic interpretation, that is, the interpretation supplied by the lawgiver himself; (2) usual interpretation, based on usage and precedent; and (3) doctrinal interpretation, or the interpretation founded upon scientific exposition of the terms of the treaty itself. The following are the commonest rules of interpretation: Words are presumed to have been used in their ordinary sense, but technical terms are used in the sense and with the meaning applied to them in the particular art to which they belong; the provision of a treaty can have but *one* true meaning and the interpretation must be mutual; the interpretation should be made with regard to the context and spirit of the whole treaty; terms peculiar to the language of one of the contracting parties must be given the meaning which they have in that language; clauses defining grants, privileges, and favors should be strictly interpreted; an interpretation which renders a treaty inoperative is to be avoided; special clauses are to be preferred to general, prohibitory to permissive; earlier clauses are explained by later ones and obscure clauses by clearer ones in later treaties, as later treaties explain and modify earlier ones on the same subject. The rule has been laid down by the United States Supreme Court that a treaty is on the same plane of equality with a statute of Congress, so that a later statute may supersede a prior treaty, while a subsequent treaty may supersede a prior statute on a given subject. A notable instance was the supersession in 1882 of a treaty with China by the act of Congress for excluding Chinese laborers. This mode of terminating treaties, however, is not sanctioned by international law and does not affect the responsibility of either contracting party for the fulfillment of its obligations. In the United States treaties go into effect from the date of signature, so far as the contracting parties are concerned, but only from the date of ratification so far as the rights of the individual are involved. Another rule of interpretation in the United States is that the Supreme Court will not undertake to enforce a treaty which requires Congressional legislation for its execution. Until such legislation is forthcoming the individual concerned must address himself to the political departments of the Government.

To secure the enforcement of treaties, it was formerly the custom to demand and receive hostages, the last instance of the kind being in 1748 to secure the execution of the Treaty of Aix-la-Chapelle. Solemn oaths accompanied by religious rites on the occasion of ratification were once common, but are no longer resorted to. Pledges are sometimes required, as in the case of the treaty of peace between Germany and France in 1871, when certain French fortresses were retained by the Germans as security for the payment of the large indemnity exacted from France. The organs for the enforcement of a treaty are the courts, the legislature, the executive, and the army and navy. Thus treaties of peace, of cession, of commerce, etc., are enforced for the most part by the legislative branch assisted by the executive, while in the case of treaties of naturalization, extradition, and treaties affecting the rights of foreigners the judicial branch plays an important part.

The most complete collection of treaties in English is that of Hertslet, four volumes. See also *The Map of Europe by Treaty*, by the same author; *Treaties and Conventions of the United States* (1776-1889); De Martens, *Recueil des principaux traités*, etc. (1761-1818). For a general discussion of the subject of treaties, see the authorities cited under the article INTERNATIONAL LAW, and Butler, *The Treaty Making Power* (2 vols., New York, 1902).

TREATY ELM. The tree in Shackamaxon, Philadelphia, under which William Penn made his famous treaty with the Indians in 1682. Its supposed site is now occupied by the Penn Treaty Monument.

TREATY RIGHTS, ECCLESIASTICAL. Those rights which are secured by treaty to the subjects or citizens of one State while residing in the territory of another State, relating to the exercise of their religion. The international agreements from which such rights arise differ radically from those treaties, generally known as concordats, which are made from time to time between sovereign States and the See of Rome to regulate the condition of the adherents of the Roman Catholic Church within the jurisdiction of the contracting State, since no ecclesiastical authority is made a party to the contract, which is directly between sovereign States in favor of the citizens of one or both. Such a body of rights belongs to the department of private international law. It had its origin in the Reformation period, when the organic unity of Western Christendom was broken and there was no single ecclesiastical authority with which a State could deal in relation to all its subjects. At the present time among the great powers of the world, and especially among those of Western civilization, the liberties and rights of foreign-born residents are amply secured by what is known as 'the most favored nation clause' of the prevailing treaties. Those nations, however, which have been foremost in missionary enterprise among peoples of a different civilization have found their interests to require intervention by their governments, and the United States of America, in the protection of widespread missionary enterprise, has secured for its citizens ecclesiastical rights in many countries. These rights differ considerably both in extent and kind, although, speaking generally, they have been elaborated as time went on and intercourse became more frequent. The first of such rights specifically mentioned was secured by the United States in its treaty of 1805 with the Sultan of Tripoli, in which it was provided that the consul or agent of the United States should have liberty to exercise his religion in his own house, and that his servants should not be impeded in going to his house at the hours of prayer. The Treaty of Guadalupe Hidalgo concluded with the Republic of Mexico in 1848 stipulated for American residents freedom from persecution on account of their religion and also liberty to propagate it. The treaty concluded in 1856 with the King of Siam provides that all American citizens visiting or residing in Siam shall be allowed the free exercise of their religion, and liberty to build places of worship in such localities as shall be assented to by the Siamese authorities. Americans have ecclesiastical treaty rights in China which were not abrogated by the foreign intervention following the 'Boxer' uprising. They are provided by two treaties, one of June 18, 1858, and the other of July 4, 1868. American citizens have a right by the terms of these treaties to teach and practice peaceably the principles of the Christian religion, to reside in those places where foreigners are permitted to reside and in such places to establish and maintain schools, and to maintain cemeteries free from profanation. They have also the right to attend the Chinese educational institutions under the control of the central Government. By the treaty of 1858 with Japan Americans are secured the free exercise of their religion and the right to erect suitable places of worship. American citizens are forbidden to injure any Japanese temple or *Mia*, and neither Americans nor Japanese are allowed to do anything calculated to excite religious animosity. The Government of Japan has abolished the practice of trampling on religious emblems. By the treaty of 1859 with the Republic of Paraguay, citizens of the United States residing in Paraguay are at liberty to exercise in private and in their own dwellings or the dwellings of the consuls of the United States their religious services, but no right of propaganda is specified. The treaty of 1830 with the Ottoman Empire merely confirmed as the treaty rights of Americans privileges already existing. American missionaries were first established in Turkey in 1818, and the privileges of extra-territoriality were then assigned to them by ancient usage. The liberty to exercise their religious functions, as a privileged class, had been *ab antiquo* granted by a voluntary extension of what is known as the 'Edict of Toleration' granted by the Turks, upon their conquest of Constantinople, to the ecclesiastics of any friendly Christian nation. While the United States was not a party to the Treaty of Berlin (1878), yet the guaranty given by the Turkish delegates applies to American citizens: "Throughout the [Ottoman] Empire the most different religions are professed by millions of the Sultan's subjects, and not one has been molested in his belief, or in the exercise of his mode of worship. The Imperial Government is determined to maintain this principle in its full force, and to give to it all the extension that it calls for." By a protocol of 1874 a qualified right to hold real estate is granted to American citizens. What is known as the 'Protestant Charter' regulates mission schools. By the treaty of 1880 with the Sultan of Morocco the right to hold property is recognized as belonging to all foreigners. The purchase of property must take place with the previous consent of the Government, and the title of such property shall be subject to the forms prescribed by the laws of the country. No freedom of religious propaganda is specified.

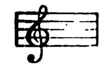
TREB′BIA (Lat. *Trebia*). A river of Northern Italy. It rises in the Apennines of Liguria and after a northeasterly course of 58 miles joins the Po near the city of Piacenza. Upon its banks Hannibal defeated the Romans under Sempronius in B.C. 218. (See HANNIBAL.) In the vicinity the Austrians and Russians under Suvaroff were victorious over the French under Macdonald, June 17-19, 1799.

TREBITSCH, trā′bĭch. A town of Moravia, Austria, 40 miles by rail east of Brünn. A fine abbey in the transition style of the thirteenth century and the palace of Count Waldstein are worthy of notice. Woolens, shoes, and malt are manufactured, and horses are dealt in. Population, in 1900, 10,597.

TREB′IZOND (Turkish *Tirabzon* or *Taraburun;* Lat. *Trapezus;* Gk. Τραπεζοῦς, *Trapezous*, probably so called because founded on a table-land, from τράπεζα, *trapeza*, table). A city of Asia Minor, capital of the Turkish Vilayet of Trebizond (Map: Turkey in Asia, H 2). It is on the Black Sea coast near its eastern end, 570 miles east of Constantinople. The city has a remarkable location, being built on a small table-land falling in steep precipices on either side toward two deep parallel valleys which run out to the coast. The highest portion is crowned by an ancient castle, and the city is still surrounded by Byzantine walls. The streets are narrow, but the city has a wide extent, nearly every house being surrounded by gardens. There are numerous churches and mosques, some of the latter being old Byzantine churches. The bazaars are mostly situated outside of the walls in the Christian quarters, the intramural portion being reserved for the Mohammedan population. The industries include wool, silk, and linen weaving, tanning, dyeing, and filigree manufactures. The harbor is an exposed roadstead, but the geographical position of Trebizond has for many centuries made it the chief entrepôt for the transit trade between Persia and Europe. It is the terminus of the main caravan route to Persia via Erzerum. The transit trade has, however, greatly declined since the opening of the Russian railroad to Batum. In 1900 the exports, which chiefly consist of cattle, hazel-nuts, tobacco, and carpets, were valued at $3,696,850, while the imports amounted to nearly twice as much. The population is estimated at about 35,000, of whom considerably more than half are Mohammedans, the rest being chiefly Greek and Armenian Christians.

Trapezus was founded by Greeks about B.C. 700 as a colony of Sinope. It was a flourishing city when Xenophon and his Ten Thousand reached it after the famous retreat. In 1204, after the occupation of Constantinople by the Crusaders, Prince Alexius of the Comnenian family established the Empire of Trebizond, and made the city his capital. This empire lasted until 1461, when it was overthrown and the city captured by the Turks.

TREBLE (OF. *treble, treible*, triple, from Lat. *triplus*, threefold, from *tres*, three + *-plus*, -fold). The highest part in harmonized music, which in general contains the melody, and is sung by a soprano voice. The treble or G clef is placed on the second line of the staff, indicating that the note G occupies the line encircled by its lower curve. It is one of the two clefs in use in music for keyed instruments. For the history of the sign of the treble clef, see NEUMES.



TRED′EGAR. A market town on the northwestern border of Monmouthshire, England, 18 miles northwest of Newport (Map: England, C 5). Coal-mining is the chief industry. The formerly important iron and steel works have been abandoned. The town owns gas and waterworks, and cemeteries. Population, in 1891, 17,341; in 1901, 18,574.

TREE (AS. *trēo*, Goth. *triu*, tree; connected with OIr. *dair, daur*, OChurch Slav. *dryevo, drŭva*, Lith. *derva*, Gk. δρῦς, *drys*, Skt. *dāru*, Av. *aru*, tree, wood). A plant which attains a considerable height and has a relatively large development of woody tissue. Trees differ from herbs in their size and in the amount of woody tissue. They differ from shrubs chiefly in size, although there are all gradations between trees and shrubs. Trees differ widely among themselves, especially in mode of branching and in leaf characters. For a discussion of their branching, see STEM. For the differences between deciduous and evergreen trees, see DURATION, also FOREST.

TREE, HERBERT BEERBOHM (1853—). An English actor and manager, born in London. He made his début in 1878 in the character of Grimaldi at the Globe Theatre. In 1884 he made a great hit in *The Private Secretary* at The Prince's. He undertook the management of the Comedy Theatre in 1887, and successfully produced *The Red Lamp*. The same year he took the Haymarket, where among his subsequent productions were *Hamlet* (1892), *Hypatia* (1893), *The Tempter* (1893), *A Bunch of Violets* (1894), *John-a-Dreams* (1894), *Trilby* (1895). In 1897 he opened the new Her Majesty's Theatre with *The Seats of the Mighty*. In 1898, after a revival of *Julius Cæsar*, he produced Grundy's *The Musketeers*, which enjoyed an exceptionally long run. Among his plays in 1901 was Clyde Fitch's *The Last of the Dandies*, in 1902 *Ulysses*. As an actor Mr. Tree is considered remarkable for his versatility, and he is also known as a writer and lecturer.

TREE-BOA. Any of various long, slender, active South American snakes of the boa family, which spend their lives in trees and have acquired a remarkable power of clinging to the moving branches, even in a high wind, without coiling their bodies about any support. The name is also specifically given to the large ringed boa (*Epicrates cenchria*). See Boa.

TREE-CAT. See Palm Civet.

TREE-CREEPERS, or Wood-Hewers. A group of birds, forming the family Dendrocolaptidæ, related to the ant-thrushes (Formicariidæ) and true oven-birds (Furnariidæ), with the tail-feathers stiff and sharp-pointed as in the woodpeckers, and similarly useful in climbing tree-trunks. The bill is usually curved and slender, and often is elongated, enabling them to pull insects out of deep crevices. About 80 species are known, all confined to tropical America; all have a similar style of coloration, some shade of brown, with white spots beneath and rufous on the wings.

TREE-CRICKET. Any one of a group of small, pale-colored crickets which usually inhabit trees and shrubs. They are nocturnal in their habits, and lay their eggs in the twigs of various plants, a habit which, when the insects are numerous, results in damage to vineyards and to raspberry and blackberry plantations. The common snowy tree-cricket (*Œcanthus niveus*) is a delicate whitish-green insect. The young hatch about the first of May, and feed upon plant-lice and the eggs of other insects. When full-grown they feed upon vegetation.

TREE-FISH. One of the Californian rockfishes (*Sebastodes serriceps*), about a foot long. It is dark olive, blackish above and yellowish below, with the front of the head coppery red, two black bands downward and backward from the eye, and several oblique black cross-bands on the sides. Black prominent ridges cross the cranium. See Rockfish; and Plate of Rockfish, etc.

TREE-FROG, or Tree-Toad. A frog of the family Hylidæ, connecting the toads with the typical frogs, and of prevailingly arboreal habits. Tree-frogs have teeth on the upper jaw and vomers, and in some genera elsewhere in the mouth. The toes are invariably claw-shaped and swollen at the base; and each carries at the tip a flattened, adhesive cushion, whose sticky secretion greatly aids the animal in clinging to smooth surfaces. Most of them are of small size, more elegant in form than the true frogs, of brighter colors and more active habits. They feed on insects, which they pursue on the branches and among the leaves of trees or shrubs. All have loud, piping notes, and are remarkable for their power of changing their colors to simulate the tint of the resting-place. (See Metachrosis.) They are also remarkable for the great variety in their methods of placing their spawn, and the character of their metamorphoses, which are severally described under Cricket-Frog, Ferreiro, Marsupial Frog, etc. The principal genus is Hyla, which contains about 150 species scattered all over the warmer forested parts of the world, but especially numerous in tropical America. The type is *Hyla arborea*, common throughout all Central and Southern Europe and Asia. Of the North American species the most familiar is *Hyla versicolor*, which is a green, gray, or brown warty frog, whose clear, loudly trilled rattle is an almost daily evening sound. One of the first notes heard in the spring in the Eastern United States is the piping of *Hyla Pickeringii*, a smaller, more yellowish species, often called 'the peeper.' The cricket-frog (q.v.) is another numerous species. Various others inhabit the Southern States. Many species of the West Indies and South America carry their eggs about on the back of the females, glued to or sunken into the skin, as is notably the case with *Hyla Goeldii*. Notable cases are described in the *Proceedings of the Zoölogical Society of London* for 1895. Australia possesses several species of great interest, especially the familiar *Hyla Cœrulea*, whose cry is a sharp crackling bark. The whole group is one of extraordinary variety and interest.

Consult authorities cited under Frog. See Colored Plate accompanying article Toads.

TREE-HOPPER. Any insect of the homopterous family Membracidæ, a very strange group comprising a variety of grotesque forms. The antennæ are inserted in front of and between the eyes, and the prothorax is so prolonged that it covers the rest of the body, and its curious modifications have been developed in order to bring about a protective resemblance of these insects to various plant structures. The tree-hoppers, like other Homoptera, have an incomplete metamorphosis, and the young are active and suck the juices of plants by means of their beaks. The species are very numerous, and the group is one of wide distribution. The most bizarre forms occur in tropical regions, but many curious species are found in the temperate zone. A common form in the United States is the little humpbacked *Telemona monticola*, which sometimes swarms on the branches of the Virginia creeper in June. Another interesting form (*Entillia sinuata*) is found upon the leaves of the sunflower and other annual plants. It lays its eggs in the midrib of the upper leaves; the mother insect broods over her eggs, and the young from the time of hatching until full-grown are constantly attended by ants, which are attracted by a sweet secretion. The 'buffalo tree-hopper' (*Ceresa bubalus*), so called from its horned prothorax, is a species of considerable economic importance, which damages the small twigs of fruit trees in the act of laying its eggs. Large holes are made in the bark, in which the eggs are inserted in clusters. Consult: Comstock, *Manual for the Study of Insects* (Ithaca, 1895); Howard, *The Insect Book* (New York, 1902).

TREE-KANGAROO. One of a genus of kangaroos which in the forests of Northern Australia and New Guinea inhabit trees, although they creep awkwardly about the branches, as if not yet well adapted to an arboreal life. They constitute the genus Dendrolagus, and embrace several species of which the black one (*Dendrolagus ursinus*) of New Guinea, which is very dark in color, except the whitish face, and about 20 inches long, exclusive of the tail, is one of the best known. See Plate of KANGAROOS.

TREE OF HEAVEN. See AILANTHUS.

TREE-PORCUPINE. One of the small, short-spined, prehensile-tailed arboreal porcupines of South America of the genus Sphingarus. See PORCUPINE, and Plate of PORCUPINES AND HEDGEHOGS.

TREE-SHREW, or SQUIRREL-SHREW. One of the curious insectivorous animals of the family Tupaiidæ, of the Oriental region and eastward to Borneo. They are related to the hedgehogs, but outwardly have almost exactly the appearance of ordinary squirrels, except for the long, flexible, shrew-like nose. Some 20 species have been named, of which the Malayan banxring (*Tupaia ferruginea*) is one of the best known, and often becomes a pet, or resides, half-tame, in gardens and village shade-trees. The Madras tree-shrew (*Tupaia Ellioti*) is found throughout India. All are much alike, feeding on both insects and fruits, and expressing emotion by a short, whistling cry.

TREE-SNAKE. Many snakes are more or less arboreal in habits, but some are so distinctively so as to merit the name especially. Many of the smaller boas (see TREE-BOA) live almost wholly in tree-tops, as is necessary in the flooded parts of the Amazonian region. Among the colubrine groups of that region is the genus Leptophis, whose species are very slender, with long whip-like tails. The best known (*Leptophis liocerus*) is a beautiful creature six feet long, the upper surface golden green, the lower yellow or white; it subsists upon small reptiles and birds and their eggs. An Oriental genus (*Dendrophis*) has the ventral scales keeled and notched, enabling them to take hold of a surface so securely that they are able to glide up the branches of trees in almost straight lines. A group of tropical green tree-snakes (Dipsadomorphæ) exists, the species of which are highly poisonous; and in Africa are found 'tree-vipers' (q.v.).

TREE-TOAD. See TREE-FROG.

TREE-VIPER. A genus (Atheris) of rather small, arboreal vipers of Africa. They are of bright green and yellow colors, so as to be readily concealed in foliage. Their tails are especially prehensile, like those of boas. Four species are known.

TREE-WORSHIP. See NATURE-WORSHIP, paragraph *Dendrolatry.*

TREFOIL. A frequent charge in heraldry (q.v.), representing the clover-leaf, which is always depicted as *slipped,* i.e. furnished with a stalk.

TREFOIL (OF. *trifoil, trefeul,* Fr. *trèfle,* from Lat. *trifolium,* trefoil, three-leaved, from *tres,* three + *folium,* leaf), BIRD'S-FOOT (*Lotus*). A genus of plants of the natural order Leguminosæ. The pods are cylindrical, somewhat spongy within and imperfectly divided into many cells. The name bird's-foot trefoil is derived from the resemblance of the clusters of pods to a bird's foot. The numerous species are natives of the temperate and colder regions of the Old World. The common bird's-foot trefoil (*Lotus corniculatus*) is common in European pastures. The spreading decumbent stems, 4 to 16 inches long, arise from a short, thick rhizome and bear umbel-like cymes of five to ten yellow flowers, which have a rich, honey-like odor. The leaves have three obovate leaflets, and at the base of each leafstalk there are two large leaf-like ovate stipules. The plant is by some regarded as the shamrock (q.v.) of Ireland. It is nutritious and much liked while young by all kinds of stock. It has been introduced into the United States, where it is common, especially in the South. A larger species, very similar, with stem nearly erect, more compact heads of smaller flowers, and much smaller seeds, is the greater or narrow-leaved bird's-foot trefoil (*Lotus major*) of much the same range. The characteristic differences remain under cultivation in every variety of soil and situation. Marsh bird's-foot trefoil (*Lotus uliginosus*) is a species common in damp meadows. The winged pea (*Lotus Tetragonolobus*), remarkable for four membranous wings which run along its pods, is a native of Southern Europe, where it is grown for salads and as an ornamental plant. It is cultivated in the United States mainly as a forage plant and a winter crop for plowing under in spring as green manure. In some parts of Europe its seeds are used as a substitute for coffee.

BIRD'S-FOOT TREFOIL (*Lotus corniculatus*).

TRE FONTANE, trā fōn-tä′nā (It., Three Fountains). The traditional scene of Saint Paul's martyrdom, a spot outside of Rome, three miles from the Porta San Paolo. According to the legend, when the Apostle's head was struck off, it made three bounds, and at each spot a spring gushed forth. Over the springs stands the Church of Saint Paul without the Walls, which contains also the column to which Saint Paul was bound.

TREGELLES, trĕ-gĕlz′, SAMUEL PRIDEAUX (1813-75). An English scholar and New Testament critic, born at Falmouth, of Quaker parentage. Though he attended the Falmouth Classical School for four years (1825-28), he was in the main a self-educated man. During the greater part of his life he was connected with the Plymouth Brethren, but in his last years he was in the communion of the Established Church. Tregelles's interest in critical studies began early, and from 1838 to his death he devoted himself almost exclusively to the study of the New Testament text and related subjects. In 1844 he published *The Book of Revelation in Greek, Edited from Ancient Authorities with a New English Version.* In 1854 his valuable *An Account of the Printed Text of the Greek New Testament* appeared. This work was not only a history, but a discussion of principles of textual criticism as well, and as such is still of great value. His next important work was his revision of the New Testament part of Horne's *Introduction* under the title, *An Introduction to the Textual Criticism of the New Testament* (1856). During all these years he was assiduously collecting material for a new critical edition of the Greek Testament, collating manuscripts, examining patristic readings and the important ancient versions with greatest care. The first part of Tregelles's *Greek New Testament, Edited from Ancient Authorities,* appeared in 1857. The last installment was published in 1872, sent out while the author was suffering from the severe illness which proved fatal not long after. Among numerous other writings not directly connected with the New Testament text his facsimile edition of the *Canon Muratorianus* (1860) and his translation of Gesenius's Hebrew Lexicon (1847) deserve mention. Tregelles's scholarship was exact and painstaking, and his industry was remarkable. His edition of the Greek Testament ranks with those of Tischendorf and of Westcott and Hort, as one of the three great critical editions of the last century. His principles, clearly worked out and consistently applied, were similar to those of Lachmann, but his reconstructed text was based on a wider and more thorough survey of the field of evidence than was Lachmann's. An *Appendix* to Tregelles's Greek Testament, edited by Hort and Streane, from Tregelles's own papers was published in 1879.

TREITSCHKE, trītsh'ke, HEINRICH VON (1834-96). A German historian. He was born in Dresden, and studied at Bonn, Leipzig, Tübingen, and Heidelberg. In 1857 he became lecturer at Leipzig, and in 1863 he was called to a professorship at Freiburg. He was an ardent believer in German unity and the mission of Prussia, and when Baden cast its lot with Austria in the Seven Weeks' War he resigned his chair and became editor of the *Preussische Jahrbücher* at Berlin, to which he had been for many years a diligent contributor. In 1866 he was called to a chair at Kiel and the following year he became professor of history at Heidelberg, where he remained until 1874, when he was called to Berlin. From 1871 to 1888 he was a member of the Reichstag, where he became a prominent spokesman of the National Liberals. He resigned the editorship of the *Preussische Jahrbücher* in 1889. After Ranke's death he became Prussian State historian (1886). He was a most successful lecturer in spite of his total deafness in his later years, and he impressed his intense German patriotism upon a large body of students who came under his instruction. He lacked the clear and impartial objectiveness of Ranke, but his sincerity and ability entitle him to a place in the group of eminent German historians. His principal work is *Deutsche Geschichte im neunzehnten Jahrhundert* (Leipzig, 1874-94), covering the period down to 1848. This work shows in the most marked degree the partisanship which appeared as so strong an element in Treitschke's scholarship. Of his numerous other writings may be mentioned *Zehn Jahre deutscher Kämpfe, 1865-74* (1874); *Schriften zur Tagespolitik* (1874-79); *Der Sozialismus und seine Gönner* (1875); *Ein Wort über unser Judentum* (1880); *Zwei Kaiser* (1888); and the posthumous volumes *Reden im deutschen Reichstag* and *Biographische und historische Abhandlungen* (1897).

TRELAWNY, tre-lạ'nī, EDWARD JOHN (1792-1881). An English author, especially known as the friend of Shelley and Byron. He was born in London. Though he was of an ancient and famous family, his education was neglected. Entering the royal navy at the age of thirteen, he served in the fleet blockading Cadiz (1805). He subsequently deserted and passed through some exciting adventures in the East Indies. In January, 1822, he met Shelley (q.v.) and Byron (q.v.) at Pisa. He was the last to see Shelley's boat disappear in the fog on the memorable eighth of July, 1822; and he superintended the cremation of Shelley's body at Viareggio, snatching the heart from the flames. In 1823 he accompanied Byron to Greece, where he took an active part in the war of liberation, and married, as his second wife, the sister of the Greek chieftain Odysseus. After living in Italy and traveling in the United States (1833-35), he settled in England, where he became the lion of London society. His last years were passed mostly in the country, in Monmouthshire and in Sussex. He died at Sompting, in Sussex. His body was cremated and buried by the side of Shelley's in the Protestant cemetery at Rome. Trelawny charmed two generations by his rich fund of anecdote. In his old age he was sought out by young men who wished to see and hear the man who had been a comrade of Byron and Shelley. He was of magnificent physique. Millais chose him for the old seaman in "The Northwest Passage." Trelawny wrote his early autobiography under the title *The Adventures of a Younger Son* (anonymous, 1831). How much is truth and how much is fiction in this book will probably never be determined. Trelawny is best known for *The Recollections of the Last Days of Shelley and Byron* (1858), republished, with changes, as *Records of Shelley, Byron, and the Author* (1878). Both are brilliant books, and the latter is of great value. Consult the edition of *The Adventures of a Younger Brother,* with memoir by E. Garnett (London, 1890).

TRELAWNY, Sir JONATHAN (1650-1721). An English bishop and third Baronet of Trelawny. He was born at Pelynt, Cornwall; graduated at Christ Church, Oxford, in 1672, and took priest's orders in 1676. He took an active part in suppressing Monmouth's Rebellion of 1685, and was rewarded with the Bishopric of Bristol. The appearance of the

First Declaration of Indulgence alienated him from King James; he refused to sign the declaration, and later successfully opposed the effort of the Earl of Bath to control the Cornish elections in the interests of the Crown. On May 18, 1683, he united with five other bishops and the Archbishop of Canterbury in drawing up a petition against the Second Declaration of Indulgence. As a result all seven were in the following month committed to the Tower on a charge of seditious libel, but were acquitted, and soon afterwards King James II. was driven from the throne. Trelawny seems not to have united in the invitation of William, but after the coronation of the new sovereigns he was made Bishop of Exeter. Consult Strickland, *Lives of the Seven Bishops Committed to the Tower in 1688* (London, 1866).

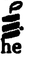
TRELEASE, tre-lēs′, William (1857—). An American botanist, born at Mount Vernon, N. Y. He graduated at Cornell in 1880, and after serving as instructor in botany at Harvard and at Wisconsin University, was professor at Wisconsin in 1883-85. In 1885 he was made Engelmann professor of botany in Washington University, Saint Louis, and in 1889 was chosen director of the famous Missouri Botanical Garden there. He was the first president of the Botanical Society of America (1884-85). He translated Poulsen's *Botanical Micro-Chemistry* (1884) and Salomonsen's *Bacteriological Technology* (1890).

TREM′ATO′DA (Neo-Lat. nom pl., from Gk. *τρηματώδης*, *trēmatōdēs*, having many holes, porous, from *τρῆμα*, *trēma*, hole). A class of Platyhelminthes, the flukes, characterized by the possession of certain suctorial pores or openings. They have soft, roundish or flat bodies, and their visceral organs are lodged in the parenchyma of the body. Most of them are hermaphrodites. They seldom reach a large size (the greatest length is about five inches), but are usually visible to the naked eye. The color is usually dull gray, green, or brown, sometimes mottled. The reproductive organs are complicated and developed to a remarkable degree, occupying a very large part of the body. These worms are not all parasitic, nor are the parasitic forms confined to a single host during the whole of their existence. Many of them, indeed, have a most remarkable life history, showing an extraordinary succession of generations, in which the young resemble not the parents or grandparents, but the great-great-grandparents. The first three or four generations live in the body of some invertebrate, especially water-snails; but the next generation is a free-swimming one, and its offspring are like the original form and parasitic within some vertebrate.

The Trematoda are divided into two orders: (1) *Ectoparasitica*, trematodes with three or more suckers, living on the outside of their hosts, and with a direct development from the egg; (2) *Endoparasitica*, trematodes with not more than two suckers, living in the blood-vessels, alimentary canal, or other spaces of the higher animals, and undergoing a complicated alternation of generations. This order includes a large number of species, many of which are dangerous, not only to the domestic animals, but even to man himself. See Fluke (Worm).

TREMBLEY, trän′blā′, Abraham (1700-84). A Swiss naturalist, principally known for his studies in Holland of the Hydra, and the discovery of its power of regenerating lost parts. (See Regeneration.) His *Mémoires pour servir à l'histoire d'un genre de polypes d'eau douce à bras en forme de cornes* brought him great fame, and has become a classic.

TREMOLITE (from *Tremolo*, an Alpine village, where the mineral was discovered). A variety of amphibole, consisting of calcium and magnesium silicate. It is white to dark-gray in color. It occurs usually in monoclinic prisms, although sometimes it is found in fibrous aggregates with a silky lustre.

TREM′OLO (It., trembling). In music, an expression indicating that a note or a chord is to be reiterated with great rapidity for an indefinite number of times, so as to produce a quavering sort of effect. In singing, the tremolo is highly effective in dramatic situations. But with many singers it is a mannerism arising from improper control of the breath. (See Singing.) For the stringed instruments the tremolo is extensively employed by composers, and is written . It is produced by a very rapid alternation of the up-and-down stroke of the bow.

TREMULANT (from ML. *tremulans*, pres. part. of *tremulare*, to tremble, from Lat. *tremulus*, trembling, from *tremere*, Gk. *τρέμειν*, *tremein*, to tremble). A mechanical device in an organ for producing a tremolo. It is regulated by a separate draw-stop affecting a thin metal plate which interferes with the free influx of air into the pipes. The rapid vibration of this plate causes corresponding oscillations in the column of air.

TRENCH, Military (from OF. *trencher*, *trancher*, Fr. *trancher*, to cut, from Lat. *truncare*, to lop, from *truncus*, trunk, from *truncus*, OLat. *troncus*, maimed). An excavation of varying dimensions, the earth from which is placed directly in front to form a parapet. Trenches are to be found in permanent and semi-permanent fortifications, as well as hasty intrenchments (see Fortification), their nature, number, and methods of construction varying with the circumstances. Trenches are necessary for both the attack and the defense, modern conditions and future indications giving a constantly increasing importance to their use by an attacking force. Time is perhaps the greatest factor in the determination of the style of trench to be adopted, or the number of men required for its construction. Usually, an average of one pace per rifle is reckoned for shelter trenches, which for troops kneeling would require a depth of about three feet, while as a shelter for men standing it would be necessary to excavate to 4 feet 7 inches, the removed earth in both cases being sufficient to provide an upper parapet of about three feet in thickness. See Fortification for illustrations and further material on field intrenchments.

TRENCH, Richard Chenevix (1807-86). Archbishop of Dublin, poet, and scholar. He was born in Dublin, and educated at Harrow and Trinity College, Cambridge, where he took his degree in 1829, and was intimate with the members of the 'Apostles' Club,' including Tennyson, Hallam, and Sterling. He was ordained deacon in 1832, and became curate to Hugh James Rose (q.v.) at Hadleigh, identifying himself to a certain extent with the High-Church Party. He held the living of Curdridge, in Hampshire, from 1835 to 1841, and then once more served as a curate under the future Bishop Wilberforce. From 1846 to 1858 he held a theological professorship at King's College, London, having meantime been appointed in 1856 to the deanery of Westminster. In 1863 he became Archbishop of Dublin, and took a foremost position in the opposition to the disestablishment of the Episcopal Church in Ireland, as well as in the settlement of the delicate questions which arose after it had been accomplished. He resigned his see, owing to infirmity, in 1884, and died in London two years later. He is remembered chiefly as a writer. Noteworthy among his theological works are: *Notes on the Parables* (1841); *Notes on the Miracles* (1846); *Commentary on the Epistles to the Seven Churches* (1861); and *Studies in the Gospels* (1867), all of which were widely popular and influential. His poetical work is graceful, tender, and thoughtful as a whole. A collected edition appeared in two volumes, 1885. His best-known books in philology are *The Study of Words* (1851), and *English, Past and Present* (1855). To these may be added his *Lectures on Mediæval Church History* (1877). Consult Trench, *Letters and Memorials of Archbishop Trench* (London, 1886).

TRENCH'ARD, STEPHEN DECATUR (1818-83). An American naval officer, born in Brooklyn, N. Y. He became a midshipman at the age of sixteen; was promoted to passed midshipman in July, 1840; was wrecked in the *Washington* off the coast of North Carolina in 1845; was attached to the *Saratoga* during the Mexican War; became a lieutenant in 1847; and was slightly wounded while serving under Tatnall when that officer assisted the English in their attack on the Pei-ho forts in China. During the Civil War he served on the *Rhode Island;* was made commander in July, 1862, and participated in the bombardments of Fort Fisher in 1864 and 1865. He was promoted to be captain in 1866, to be commodore in 1871, and to be rear-admiral in 1875; commanded the North Atlantic Squadron in 1876-78; and retired in 1880.

TRENCK, FRANZ VON DER, Baron (1711-49). A German soldier of fortune, born at Reggio, in Calabria, the son of a lieutenant-colonel in the Austrian service. He became a cavalry officer at seventeen, distinguished himself by his mental accomplishments, his remarkable success in the fields of gallantry, and his love for dueling, and miscellaneous murder, which in the end forced him to leave the army. He went to Russia, where he was made a captain of hussars, but was cashiered not long afterwards for gross insubordination and imprisoned at Kiev, whence he returned to settle on his estates in Slavonia. There it is we first meet with the Trenck of history. The Turkish frontier was overrun with banditti. Trenck armed and drilled 1000 of his tenants, whom he called Pandours, and by their means succeeded in restoring order. In 1741 he offered the services of his regiment to Maria Theresa, and his aid was accepted. He then took part in the Silesian wars at the head of his men. On September 7, 1742, he attacked Cham, a trading town in neutral territory, and annihilated it. After the battle of Sohr, in September, 1745, he made an unsuccessful attempt to capture Frederick the Great. His deeds of violence at last led to his trial before a court martial and condemnation to imprisonment for life. He was confined at the Spielberg, near Brünn, until his death, caused by poisoning himself when he found escape impossible. Consult: Hübner, *Franz von der Trenck* (Stuttgart, 1788); and Trenck's own Memoirs, *Merkwürdiges Leben und Thaten des Freiherrn Franz von der Trenck* (Vienna, 1770).

TRENCK, FRIEDRICH VON DER, Baron (1726-94). A German adventurer, born at Königsberg, the son of a Prussian general and cousin of the preceding. At sixteen he became a cornet in the guards and in 1744 ordnance officer to Frederick the Great, but was soon after imprisoned at Glatz, either because of a love affair with the King's sister or because of his correspondence with his cousin Franz which raised doubts as to his loyalty. He escaped in 1746 and after many wanderings became, in 1749, captain of cuirassiers in the Austrian service. While in Danzig in 1754 he was arrested by order of Frederick and kept in severe confinement at Magdeburg till 1763. After his release he settled at Aix-la-Chapelle, where he married the burgomaster's daughter, gave himself to literary pursuits, and went into business as a wine merchant. In 1774-77 he traveled in England and France, and, restored to the possession of his Prussian estates after the death of Frederick II., lived at Berlin and Königsberg. In 1791 he went to Paris and became a zealous adherent of the Mountain Party. He was, however, suspected of plotting with the foreign enemy and was guillotined July 25, 1794. Consult the autobiographical *Friedrich Trencks merkwürdige Lebensgeschichte* (Berlin, 1787), which he rendered into French in 1789. His collected writings were published at Leipzig in eight volumes (1786).

TRENDELENBURG, trĕn′de-len-bo͞ork, ADOLF (1802-72). A German philosopher, born at Eutin. He was educated at Kiel, Leipzig, and Berlin; was appointed professor extraordinary of philosophy in the University of Berlin, 1833, and full professor in 1837. In this position, which he held until his death, January 24, 1872, he exercised very great influence upon the course of philosophical thought. His criticism of Hegel procured him great renown, and was one of the most effective forces that broke the hold of Hegelianism on the German mind. The foundation of his own philosophic doctrine is Aristotelianism, which, however, was modified by Platonic elements. He held and developed the teleological view and maintained that it is confirmed by empirical fact. Mechanical causation he viewed as the servant of teleology, not its enemy. He called his philosophy the 'organic view of the world.' His most important works are *Logische Untersuchungen* (1840, 3d ed. 1870) and *Naturrecht auf dem Grunde der Ethik* (1860; 2d ed. 1868). His *Historische Beiträge zur Philosophie* (1846-67) are also valuable helps in the study of the history of philosophy. Consult: Bonitz, *Zur Erinnerung an Trendelenburg* (Berlin, 1872); Bratuscheck, *Adolf Trendelenburg* (ib., 1873).

TREN'HOLM, George A. (1806-76). An American merchant and financier, born at Charleston, S. C. He engaged in business at Charleston, and was very successful. During the Civil War he successfully ran the blockade and secured much needed supplies for the Confederacy. From June, 1864, until the end of the war, he was Secretary of the Treasury of the Confederate States. After being imprisoned until October, 1865, he was pardoned by President Johnson.

TRENT. A river rising on the northwest border of Staffordshire, England, about 10 miles north of Burslem (Map: England, F 4). It flows first southeast to the border of Derbyshire, and afterwards in a generally northeast direction, through the counties of Derby, Nottingham, and Lincoln, to a point about 8 miles east of the town of Goole, where it unites with the Ouse (q.v.) to form the Humber (q.v.). It receives the Derwent, Idle, and Tarn from the west, and the Soar from the south; it is navigable by barges for 120 miles, from its mouth to Burton-on-Trent. Length, 170 miles.

TRENT. A wide and picturesque river of Ontario, Canada, which has its outlet at Trenton, on the Bay of Quinté, Lake Ontario (Map: Ontario, F 3). It issues from the northeast end of Lake Rice and drains a system of lakes and rivers which extends to Georgian Bay on Lake Huron.

TRENT (It. *Trento*, Ger. *Trient*). A town of Tyrol, Austria, 76 miles northwest of Venice, on the left bank of the Adige (Map: Austria, B 3). It is built largely in the Italian style and has some beautiful old palaces. In the Piazza Grande is the celebrated Fountain of Neptune, made of red marble. A beautiful bronze statue of Dante (by Zocchie, 1896) stands in the Piazza di Dante. The Romanesque cathedral, begun in its present form early in the thirteenth century and completed in the fifteenth, constructed entirely of white marble, is the most striking public building. The Church of Santa Maria Maggiore is noted as the sitting place of the Council of Trent (q.v.). Among the other interesting architectural features are the castle (the former residence of the prince bishops) and two ancient towers. The municipal building contains a museum of Roman antiquities and other objects. Trent is the chief town of the Italian or 'Welsch' division of Tyrol. The chief industries are silk-weaving, the making of salami (a kind of sausage), playing-cards, pottery, cloth, and wines, and the quarrying of marble and gypsum. The town is the seat of a bishop. Population, in 1900, 24,908. Trent is the ancient Tridentum, which was a Roman colony. It was under the rule of bishops from the eleventh century to the beginning of the nineteenth century, when it passed to Austria.

TRENT, Council of. The most notable of the modern ecumenical councils of the Roman Catholic Church, held with intermissions from 1545 to 1563. It was the culmination of the Counter-Reformation (q.v.), and its decrees crystallized the results of that movement into the permanent law of the Church. For centuries those who felt the need of reform within the Church had appealed to a general council, and the long-growing discontent with the condition of things after the Great Schism had led to the great councils of the fifteenth century. The Protestant Reformation had taken many of the most ardent advocates of reform out of the Church, and left the conservative-minded party in control. A council was at first desired by Luther and his supporters as a means of closing the great breach. At the Diet of Nuremberg in 1523 the German estates appealed to Adrian VI. for the summoning of a council "within a year, in concert with the Imperial Majesty and in a German city." Adrian died in the same year, and his successor, Clement VII., while not refusing a council, did nothing toward calling one; and the political breach between Charles V. and the Holy See made the Emperor's requests unfruitful. Thus it happened that when the design was put into execution in the pontificate of Paul III., the Augsburg negotiations (see Reformation) had failed, the break in Christendom was an accomplished fact, and the sincere but reactionary party was left in control.

The Council was finally assembled at Trent, December 13, 1545. The Emperor desired to have the discussions opened on points of general agreement, in the hope of gaining the confidence of the Protestants; but the party in control brought to the front the questions most in dispute—the authority of the Scriptures in the Vulgate text, the right of interpretation, ecclesiastical tradition, and the doctrine of justification, as to which the old positions were maintained. Certain administrative reforms were early decreed. Bishops were to provide better schools in their dioceses, and were themselves to expound the Word of God; qualifications for the episcopal office were defined, and penalties imposed for the neglect of duties; dispensations and privileges were restricted. The Emperor opposed the course of the Council, and on March 11, 1547, its sittings were transferred to Bologna, where it was thought the Imperial influence would not be so much felt. In 1549 Paul III. died and was succeeded by Cardinal del Monte as Julius III. The latter reassembled the Council at Trent May 1, 1551; but, after the sixteenth session, the city having become insecure on account of the activity of the Protestant forces under Maurice of Saxony, the sittings were again suspended for two years. After the brief reign of Marcellus II., Cardinal Caraffa, one of the ablest leaders of the uncompromising Catholic party, came to the Papal throne as Paul IV.

The Council now proceeded to carry out a conservative reorganization of the Church, though its work was again suspended for a time owing to the disturbances of Paul's pontificate. Pius IV., the former Cardinal Gonzaga, reconvened it in 1560, and much important work was done, looking to a restoration of the Papal authority in its fullness. Ecclesiastical laws were codified; questions which had hitherto been open were definitely ruled; uniformity of faith and discipline was established. To regulate some of the abuses of the system of indulgences, it was decreed that bishops should collect the payments made in connection with it, while the power of granting indulgences was affirmed as instituted by Christ and to be retained as useful to Christians. Episcopal control of monastic orders was provided for, though the Jesuits secured a larger measure of freedom. Several matters of detail were referred to the Pope for decision. The decrees were read and subscribed by about 200 bishops on December 3 and 4, 1563, and the Council finally adjourned. The decrees were confirmed by the Pope January 26, 1564, and he also prepared a confession of faith summarizing their doctrinal features. (See PIUS IV., CREED OF.) In spite of opposition, the work of the Council was so clear, logical, and thorough, and so well supported by the hierarchy, that it had a permanent and far-reaching effect, setting the standard of Roman Catholic faith and practice (with the exception of the two definitions of the Immaculate Conception and the Infallibility of the Pope) to the present day. The best modern edition of the documents relating to the Council is *Tridentinum Concilium; Actorum, Epistularum, Tractatuum nova Collectio* (Freiburg, 1901 et seq.), or Theiner, *Acta Genuina Sacri Concilii Tridentini* (Agram, 1874). The approved English translation is that of Waterworth. Works supplementary to that of the Council itself were a catechism by the Pope for parish priests and preachers, and authentic editions of the Vulgate Bible, the missal, and the breviary. A permanent tribunal at Rome, the Congregation of the Council, deals with questions which arise as to the meaning, authority, or effect of the decrees and canons of the Council. The contemporary histories of the Council were those of Fra Paolo Sarpi (see SARPI, PAOLO), *Istoria del Concilio Tridentino* (London, 1619; in Latin, 1620; Eng. trans. by Brent, 1676), written from a hostile, almost a Protestant point of view; and Sforza Pallavicini, *Istoria del Concilio di Trento* (Rome, 1656-57; revised by the author, 1666; ed., annotated by Zaccaria, 1833; French trans. by Migne, Paris, 1844), a friendly history, a reply to Sarpi. Consult also: Mendham, *Memoirs of the Council of Trent* (London, 1834-42); Wessenberg, *Die grossen Kirchenversammlungen des fünfzehnten und sechszehnten Jahrhunderts* (Constance, 1840), a Roman Catholic work; Göschl, *Histoire du grand concile général de Trente* (Regensburg, 1840); Maynier, *Etudes historiques sur le concile de Trente* (Paris, 1874); Döllinger, *Sammlung von Urkunden zur Geschichte des Concils von Trient* (Nördlingen, 1876); Philippson, *La contre-révolution religieuse au XVIème siècle* (Paris, 1884).

TRENT, WILLIAM PETERFIELD (1862—). An American literary critic, born in Richmond, Va. He was educated at the University of Virginia and at the Johns Hopkins University. From 1888 to 1900 he was professor of English and history in the University of the South (Sewanee, Tenn.), and in 1893-1900 was dean of the academic department of that institution. In 1900 he was appointed professor of English literature in Columbia University. He founded the *Sewanee Review* in 1892, and edited it until 1900. He contributed articles in American literature to *The New International Encyclopædia*, and published the following works: *English Culture in Virginia* (1889); *William Gilmore Simms* (1892); *Southern Statesmen of the Old Régime* (1896); *The Authority of Criticism* (1899); *Robert E. Lee* (1899); *Verses* (1899); *John Milton* (1899); *War and Civilization* (1901); *Progress of the United States During the Nineteenth Century* (1901); and *A History of American Literature* (1903), besides editions of school texts of Balzac's *Comédie Humaine* (32 vols., 1900) and of *Colonial Prose and Poetry* (with B. W. Wells, 3 vols., 1901).

TRENT AFFAIR, THE. A diplomatic episode growing out of the seizure by an American vessel on November 8, 1861, during the Civil War in America, of two Confederate commissioners on board a British mail steamer. In the autumn of 1861 the Confederate Government sent John Slidell and James M. Mason as commissioners to France and England respectively. They ran the blockade at Charleston and went to Havana, where they embarked for England on the British mail steamer *Trent*. On November 8th Capt. Charles Wilkes (q.v.) of the United States vessel *San Jacinto* stopped the *Trent* on the high seas, sent a searching party on board and arrested the commissioners, who were eventually placed in Fort Warren, Boston Harbor, as prisoners. This act was applauded by the people of the North, and by many of the political leaders, including the Secretary of the Navy; but President Lincoln and Secretary of State Seward recognized the impropriety of the act and strongly disapproved it, and when a formal demand was made by the British Minister for the surrender of the commissioners it was speedily complied with and an apology tendered, on the ground that the commissioners had been forcibly taken from a neutral vessel on the high seas and in the prosecution of a voyage from one neutral point to another. Consult Harris, *The Trent Affair* (Indianapolis, 1896), which contains a bibliography.

TRENTON. A town and port of entry of Hastings County, Ontario, Canada, on both banks of the Trent at its outlet in the Bay of Quinté, Lake Ontario (Map: Ontario, F 3). It has lumbering and manufacturing interests. Population, in 1901, 4217.

TRENTON. The county-seat of Grundy County, Mo., 83 miles east by north of Saint Joseph; on the Chicago, Rock Island and Pacific, and the Omaha, Kansas City and Eastern railroads (Map: Missouri, C 1). It is the seat of Ruskin College (non-sectarian), opened in 1900, and has the Jewett Norris Free Public Library, with 6000 volumes. Trenton is largely interested in coal-mining. The Chicago, Rock Island and Pacific Railroad maintains repair and machine shops here. Under a charter of 1893 the government is vested in a mayor, elected biennially, and a unicameral council. Trenton was settled in 1840, and was first incorporated in 1857. Population, in 1890, 5039; in 1900, 5396.

TRENTON. The capital of New Jersey and the county-seat of Mercer County, 57 miles southwest of New York and 33 miles northeast of Philadelphia; on the Delaware River, at the head of steamboat navigation, on the Pennsylvania and the Philadelphia and Reading railroads, and on the Delaware and Raritan Canal (Map: New Jersey, C 3).

An electric railway covers the city in every direction, and four suburban trolleys radiate in all directions to numerous towns and villages. Cadwalader Park, a beautiful public resort of 100 acres, is supplemented by several smaller parks. Riverside Park, embracing two miles of river front, is being laid out (1904). A graceful granite shaft 160 feet high and surmounted by a bronze statue of Washington, of colossal size, marks the spot at the 'head of town' where Washington planted his cannon at the battle of Trenton. Among other monuments is one of granite in Riverview Cemetery over the grave of Gen. George B. McClellan.

Conspicuous public buildings are the State Capitol, the new white marble city library, which has some 30,000 volumes, the new $300,000 county court-house, Young Men's Christian Association building, Masonic Temple, the high school, and three large theatres. A State armory, to cost $250,000, is in course of construction (1904). There are 28 public schools with about 200 teachers and about 9000 pupils; also a public school of industrial arts, one Catholic college, and the State Normal and Model schools. The State schools have over 1000 students. There are three hospitals, two day nurseries, and two children's homes. The State Deaf Mute School, the New Jersey Odd Fellows' Home, the New Jersey Home for Girls (reformatory), a State Hospital for the Insane, the State Prison, and the State Arsenal are also here. The Inter-State Fair held each fall at Trenton is one of the largest exhibitions of its kind in the East.

Trenton is a noted industrial centre. In the census year 1900 the various manufactories had $26,175,000 capital, and an output valued at $31,646,000. The potteries, 40 in number, and employing 5000 hands, produce annually $5,000,000 worth of table ware, plumbers' supplies, electrical fixtures, and artistic porcelain. Of national reputation is the John A. Roebling's Sons Company, wire and cable manufacturers, whose works cover 30 acres, employ about 5000 hands, and produce $15,450,000 worth of goods annually. Other notable establishments are the American Bridge plant, the Jordan L. Mott Iron Works, the De Laval Steam Turbine Works, a dozen big rubber concerns, large tile factories, and the Trenton Iron Works. There are also watch works, numerous brick yards, builders' hardware works, woolen mills, shirt waist factories, carriage factories, anvil and tool shops, breweries, an oilcloth and linoleum factory, church and school furniture works, boat-building yard, etc. The shipping facilities by rail, canal, and river are excellent and considerable freight is handled. There is also a large retail trade with the rich agricultural country which supplies Trenton markets.

The government is vested in a mayor, elected biennially, a common council of 28 members, and the usual administrative boards. The assessed valuation of property is about $35,000,000; and the public debt is less than $2,000,000. Trenton's municipal expenditures aggregate about $700,000 annually, of which about $90,000 is for schools; a like sum for the police department; $80,000 for the fire department; and $60,000 for street lighting. The water supply from the Delaware is stored in a new $500,000 reservoir of 110,000,000 gallons' capacity. The water-works are owned by the municipality.

Population, in 1790, 1946; in 1810, 3002; in 1850, 6461; in 1870, 22,874; in 1880, 29,910; in 1890, 57,458; in 1900, 73,307. The total in 1900 included 16,793 persons of foreign birth and 2096 of negro descent.

First settled about 1676, Trenton was generally known as 'The Falls' until in 1719 it received its present name in honor of William Trent, Speaker of the House of Assembly. It was incorporated as a borough in 1746, was selected as the State capital in 1790, and was chartered as a city in 1792. In 1776 it was occupied by the British, who pursued General Washington to this point. Late in December, 1776, Washington, stationed with his army on the other side of the river, planned a movement against Trenton and Bordentown, where General Donop with a small Hessian force was stationed. Trenton was occupied by a garrison of about 1500 Hessians under Colonel Rahl. General James Ewing with about 550 men was to cross the Delaware just below Trenton, seize the Assanpink, and thus sever communication between Donop and Rahl; Colonel John Cadwalader was to cross at Bristol, below Bordentown, and attack Donop from the south, and General Putnam with about 1000 men was to coöperate with about 1000 men from Philadelphia. The main movement, however, was to be made by Washington in person, who with 2400 men was to cross at McConkey's Ferry, nine miles above Trenton, and assail Rahl at Trenton. The movement was set for the night of December 25th-26th. By reason of storms and of the river being clogged with ice, Ewing and Cadwalader were unable to effect a crossing, while Putnam was detained in Philadelphia. Washington, however, with the aid of Marblehead fishermen under Glover, crossed in spite of all obstacles by 3 o'clock in the morning of the 26th, began his march to Trenton at about 4 o'clock, and at about eight completely surprised the garrison, which, after a night of Christmas festivities, had taken little precaution against surprise and had made little preparation for resistance. Rahl was soon forced to surrender, and Washington secured about 1000 prisoners. The American loss was 2 killed and 3 wounded, while the Hessians lost about 40 killed or wounded. Soon afterwards Washington recrossed the Delaware to his former position. This success, together with that at Princeton on January 3, 1777, greatly revived the spirits of the Americans, and did much to prevent the threatened disintegration of Washington's army. Consult: Lee, *History of Trenton* (Trenton, 1895); Raum, *History of the City of Trenton* (Trenton, 1871); and Stryker, *The Battles of Trenton and Princeton* (Boston, 1898).

TRENTON SERIES. An important stratigraphic division comprising the Trenton, Utica, and Hudson stages of the Ordovician system. The type localities of the rocks are in central and eastern New York, where the lowest stage—the Trenton—consists of a thinly bedded, dark gray to black limestone, while the Utica and Hudson stages are represented by carbonaceous shales. The same series of strata appears also on the northern shores of Lake Ontario in Canada, outcropping as far west as Georgian Bay. In Ohio the Hudson stage is known as the Cincinnati shales and is of great thickness. The strata occur also in the Upper Mississippi Valley and in several of the Rocky Mountain States. The Trenton rocks are the source of the great petroleum industry in the Lima field of Ohio and Indiana, and in addition yield valuable supplies of natural gas. The Salina limestone, which is the equivalent of the Upper Trenton stage and outcrops in Iowa, Illinois, and Wisconsin, contains important deposits of lead and zinc ores. See Ordovician System.

TREPANG (from Malay *tripang*), or **Bêche de Mer.** The dried body of a holothurian (q.v.), regarded as a delicate article of food by the Chinese. Several species are utilized, especially *Holothuria edulis*, which abounds along the coasts of Eastern Asia and all the islands to the Philippines and Eastern Australia. These animals are usually about eight or nine inches long, but some are two feet in length. They are often found nearly buried in the coral sand, their tentacles only appearing above it. The larger ones are sometimes speared in shallow water; but most of them are taken by divers. They are split down one side, boiled, pressed flat with stones, dried in the sun, and afterwards in smoke, and packed in bags. Macassar is the centre of the trade, whence several hundred tons are annually sent to China. Trepang is also gathered and prepared to some extent in California. It is highly gelatinous and nutritious, though almost tasteless. It is utilized as an ingredient in soups.

TREPHINE, TREPHINING (Fr. *tréphine*, for **trépine*, diminutive of *trépan*, trepan, from ML. *trepanum*, from Gk. *τρύπανον*, *trypanon*, auger, trepan, from *τρυπᾶν*, *trypan*, to bore, from *τρύπη*, *trypē*, hole, from *τρέπειν*, *trepein*, to turn). The operation of trephining consists in the perforation of a bone by means of a trephine, which is a small cylindrical or circular saw, with a centre-pin on which it works. The trephine produces a hole in the skull varying usually from one-fourth to an inch or more in diameter. The larger sizes of trephines are not now employed so much as formerly, it being usually the custom to make as small an opening as possible with the trephine, enlarging it where necessary by means of rongeur forceps, the chisel, or some short special form of saw, such as Hey's saw. The trephine is especially employed in fracture of the skull where the fragments of bone cannot otherwise be raised, as by the use of the elevator and chisel alone. In other conditions the operation of trephining is often a mere introductory step, giving a point of entrance at one or more places from which extensive flaps of bone are broken away or turned back for free access into the cranial cavity. The operation is oftenest employed alone in cases of abscess of the brain where a very limited area of brain substance requires to be exposed. The point of application of the trephine in cases of abscess as well as many cases of pressure from hemorrhage, either above or below the dura; is often clearly indicated by definite symptoms of brain irritation, known as 'localizing symptoms.'

TRÉPORT, trā'pōr', Le. A town of the Department of Seine-Inférieure, France, situated at the mouth of the Bresle, and overhung by a high, picturesque cliff, 45 miles north-northeast of Rouen (Map: France, H 1). Its proximity to Paris has made it a popular bathing resort. Tréport has a sixteenth-century tower, now used as the town hall, the sixteenth-century Church of Saint Jacques, an old Renaissance Timber House, and a conspicuous casino. There is a considerable trade. Sugar is the leading export. The harbor is good, and a canal extends to Eu. Population, in 1900, 4949.

TRES'COT, William Henry (1822-98). An American diplomatist, born at Charleston, S. C. He graduated at Charleston College in 1840; studied law in Harvard, and was admitted to the bar in 1843; became secretary of the United States legation in London in 1852; and was Assistant Secretary of State from June, 1860, until the secession of South Carolina. During a part of this period he was also the confidential agent of his State. In 1862, 1864, and 1866 he was elected to the State Legislature, and he also served on the staff of General Ripley. In 1877 he was one of the agents of the United States Fishery Commission at Halifax; in 1880 helped to revise the treaties between the United States and China; in 1881 was sent as special envoy to Chile, Bolivia, and Peru, which were then at war; and in 1882 was associated with General Grant in negotiating a new treaty with Mexico. Among his published works are: *Diplomacy of the Revolution* (1852); *An American View of the Eastern Question* (1854;) and *Diplomatic History of the Administrations of Washington and Adams* (1857).

TRESPASS (OF. *trespas*, departure, Fr. *trépas*, decease, from OF. *trespasser*, to pass over, depart, die, Fr. *trépasser*, to die, from ML. *transpassare*, to pass over, from ML., Lat. *trans*, across, through + ML. *passare*, to pass, to step, from Lat. *passus*, pace). This term first appears in English law as the name of a form of action brought for the recovery of damages resulting from an act of violence done to the person or property of the plaintiff. Now that forms of action are generally abolished, the term is used almost exclusively to denote the wrongful conduct for which an action in trespass, as distinguished from an action on the case, or of trover, could have been brought at common law. In this sense, trespass means a direct and forcible injury to the person or the property of another. The most frequent examples of trespass to the person are afforded by assault and battery (q.v.) and by false imprisonment (q.v.). It does not extend to acts which are lawful in themselves, and are actionable only because done negligently. Such acts were remediable under the old system of procedure by an action on the case.

Trespass to goods or chattels consists in the wrongful disturbance of another's possession of them. Thus, if one injure or destroy a chattel which belongs to another without taking it from the possession of the rightful owner, or if he wrongfully deprive such owner of its possession without doing it any injury, or if he do both of such wrongs, he is guilty of trespass. There is no crime involved in thus forcibly taking property from the possession of its owner, unless the act be done *animo furandi*—i.e. with an intent to commit a felony. The mere wrongful retention of the personalty of another, even though it follow a trespass in the taking thereof, is not in itself a trespass, but constitutes the tort of conversion. It is no defense to an action of trespass that a third party was entitled to the property at the time the defendant disturbed the plaintiff's possession, unless it is also shown that the defendant's act was authorized by such third party. The defendant must stand, if at all, on the strength of his own right to possession, not on the weakness of the plaintiff's. A wrongful intention is not necessary to actionable trespass to chattels. One who voluntarily interferes with the possession of another is bound to know whether he is acting lawfully or not. Inevitable accident, however, is a defense.

Trespass to real property is an unlawful entry upon the lands of another. Every man's land is regarded by the law as surrounded and separated from that of his neighbors by a *close* or boundary. This may be a visible, tangible object, such as a fence or a hedge; but if none such exist, there is thrown around the land, in contemplation of law, an invisible, ideal boundary which effectually separates it from the property of all other persons. Any unwarrantable breaking through this *close,* and thereby entering or sending a person or personal property upon the land which it surrounds, even though no actual injury be done to the property, constitutes a trespass, for which an action at law will lie in favor of any one rightfully in possession when such act is done. No crime is usually committed by such a wrongful entry; and this is so even when the owner or rightful possessor has put up notices upon the land, as is so frequently done, stating that 'Trespassers will be prosecuted,' or using other words to that effect. If, however, the trespasser wantonly injure the property, as by breaking down the trees or crops, he may be criminally prosecuted for malicious mischief. A person may commit trespass for which he will be liable in a civil action for damages, not only by his own entry upon land, but also by wrongfully sending his personal property upon it or permitting it to go there. Thus, if he unwarrantably drive his cattle upon his neighbor's soil or negligently permit them to go upon it, he becomes liable to an action in trespass for the resulting damages. The common law also gives to the injured land-owner, in such cases, another remedy by permitting him to distrain or impound the cattle thus *damage feasant,* or doing damage, until their owner renders him satisfaction for the injury sustained.

At common law the owner of a dog or cat was not liable for its trespasses. Various reasons were assigned for this, such as the difficulty of keeping these animals under restraint, the slightness of the damages ordinarily inflicted by their wanderings, and the common usage of allowing them greater liberty than that accorded to cattle. But if a dog, or cat, or other such animal be known by its owner to have vicious propensities, and, because of his failure properly to restrain it, it injure the person or property of another, he will be liable in damages.

There are some circumstances under which entry upon the land of another without his consent is justifiable or excusable, and so does not constitute a trespass. Thus, if a public highway be so obstructed as to be impassable, a traveler may rightfully go around the obstruction upon the private land of an individual; and a person who, by virtue of a contract with another, has become the owner of personal property upon the latter's land, may enter and take it from such land; and again, when a vendor of personal property has rescinded the sale because of fraud practiced upon him, he may enter upon the land of the vendee, if not forbidden by the latter, and retake the property sold, and the same rule holds whenever an owner of land has wrongfully acquired possession of the personalty of another and placed it upon his own land. It is generally the rule, however, with these few exceptions, that a person who goes or sends upon the land of another, and takes his own chattels without permission of such land-owner, however such chattels may have come to be there, is guilty of a trespass. If a trespass be attempted upon real property, or upon personal property which is in the actual possession of its owner, the person rightfully in possession of the same may properly use all the force that is necessary to prevent the commission of the wrong. But if he employ more force than is actually needed to repel the violence of the intruder, he makes himself liable to an action for assault and battery, and his act may constitute a crime. Growing out of this right to make use of so much violence as is requisite to prevent intrusion is the well-known common-law maxim that "A man's house is his castle." Yet there are a few cases in which even the privacy of a person's dwelling-house may be invaded without his permission. An officer of the law, when executing criminal process—as in seeking to apprehend a criminal or one charged with a crime—may use the needed force to enter a building in which such person is secreted. And even in the execution of civil process an officer may break open inner doors after he has peaceably obtained entrance into the house; but no civil process can authorize him to employ force or violence to obtain ingress through the outer door of a dwelling. There are, moreover, many circumstances under which persons are invited, by implication, to go upon the property of others and so do not become trespassers, if, not being expressly forbidden to do so, they so enter. Thus, it is ordinarily no act of trespass for a person to enter the house of his neighbor upon matters of business or to make a social call; so keepers of stores, theatres, hotels, etc., hold out to the public a general invitation to enter upon their properties for the purpose of dealing with them. But even in such cases those who enter or remain against the express prohibition of the owner or proprietor become trespassers in so doing. If one go upon the property of another rightfully, but abuse or make ill use of the privilege or authority under which he entered, as if he go into a tavern or theatre and refuse to leave within a reasonable time or when ordered to do so, he thereby becomes a trespasser *ab initio,* or from the time when he entered.

Consult: Pollock and Maitland, *History of English Law* (2d ed., Boston, 1899); Pomeroy, *Remedies and Remedial Rights* (Boston, 1883); Pollock, *The Law of Torts* (London and New York, 1901).

TRESSURE. In heraldry (q.v.), a subordinary.

TREVELYAN, tre-vĕl'yan, Sir CHARLES EDWARD (1807-86). An Anglo-Indian official. He was born at Taunton, Somersetshire; received his education at the Charterhouse and Haileybury College; entered the East India Company's civil service, and in 1827 went to Delhi as assistant to Sir Charles Theophilus Metcalfe, chief commissioner. Through his efforts in the cause of native education the Government encouraged and supported the promotion of European literature and science among the natives. In 1840 he was appointed Assistant Secretary to the Treasury, retaining the position until 1859. With Sir Stafford Northcote he prepared in 1853 a report entitled *The Organization of the Permanent Civil Service*, which is the basis of all subsequent civil-service legislation. In 1848 he was made Knight Commander of the Bath, and in 1859 was appointed Governor of Madras. He was appointed Finance Minister in India in 1862, and retired in 1865 on account of ill health. Important reforms were made in the system of accounts during his financial administration, and the resources of India developed by a great expansion of public works. He was created a baronet in 1874. He was the author of several valuable treatises, of which the better known are: *Education of the People of India* (1838); *The Irish Crisis* (1848); *Christianity and Hinduism* (1882).

TREVELYAN, Sir GEORGE OTTO (1838—). An English politician and author, the only son of Sir Charles Edward Trevelyan (q.v.) by his wife, Hannah More Macaulay, sister of Lord Macaulay. He was born at Rothley Temple, Leicestershire, and was educated at Harrow and at Trinity College, Cambridge. After a short period in the East Indian civil service, he entered Parliament in the Liberal interest, for Tynemouth (1865) and for the Hawick Burghs (1868). He was appointed Civil Lord of the Admiralty under the first Gladstone Administration (December, 1868), but resigned (July, 1870) owing to disagreement with the Premier on the Education Bill. In the second Gladstone Administration he became Parliamentary Secretary to the Admiralty (November, 1880), Chief Secretary to the Lord Lieutenant of Ireland (May, 1882), and Chancellor of the Duchy of Lancaster (1884). At the beginning of the third Gladstone Administration he was appointed Secretary for Scotland (1886), but he resigned (March, 1886) because of the bill for establishing an Irish Parliament. And again in the last Gladstone Administration he was Secretary for Scotland (1892-95). In 1897 he resigned his seat. Trevelyan was among the foremost in abolishing the purchase of commissions in and out of Parliament and in extending household suffrage to the counties. Among his publications are: *The Competition Wallah* (1864); *Cawnpore* (1865); *The Life and Letters of Lord Macaulay* (1876); *The Early History of Charles James Fox* (1880); and the very valuable work *The American Revolution* (parts 1 and 2, 1899, 1903).

TREVES, trēvz (Ger. *Trier*). A city of Prussia, in the Rhine Province, on the right bank of the Moselle, 69 miles southwest of Coblenz (Map: Germany, B 4). It is situated in a region of hills, vineyards, and woods, and presents a picturesque appearance. The town lies in a compact form, surrounded on three sides by promenades called allées. In the old city proper the streets are narrow and crooked. On the north is the Porta Nigra, an ancient fortified gate with towers—a splendid Roman relic. In the northeastern part of the city stands the cathedral, one of the oldest churches in Europe. The ancient edifice on whose site it stands appears to have been used as a church already in Roman times. The building has been repeatedly restored as the result of wars and the ravages of centuries. Among its contents are an alleged nail from the cross, and the famous seamless 'Holy Coat,' which is exposed to view at stated, though not frequent, times. There are fine cloisters leading to the charming Liebfrauenkirche—an early Gothic structure belonging to the first half of the thirteenth century.

In the southeastern part of Treves is the spacious Palace Square, at the north end of which stands a brick basilica dating probably from the commencement of the fourth century, now used as a Protestant church. At the south end of the square rises the Roman palace, a picturesque mass of ruins. The valuable provincial museum is near by. Among its remarkable antiquities are 60 hermæ, torsos of Cupid and of an amazon, a mosaic credited to Monnus, and the Roman tombs from Neumagen, dating from the commencement of the Christian Era and representing the costumes and daily life in this region at that period. A short distance southeast of the city is a Roman amphitheatre, built in Trajan's time. In the southwestern part of Treves, close to the Moselle, are the Roman baths—a vast and impressive ruin. Two miles to the west, on a hill, rises the Column of the Virgin, commemorating the promulgation of the dogma of the Immaculate Conception.

The municipal library, containing over 100,000 volumes and manuscripts, is connected with the gymnasium, and possesses rare works of ancient date. Among them is the illuminated Codex Egberti, dating from the close of the tenth century. There are also the Codex Aureus and the Fust and Gutenberg Bible of 1450. The manufacturing interests are varied and important. There are tanneries, iron foundries, dye works, furniture and piano factories, glass painting works, etc. The trade is extensive in wine, fruit, and wood. The town possesses a school of viticulture. There are many mines in the vicinity, including lead, copper, and tin mines. The population in 1900 was 43,324.

HISTORY. Treves is usually considered the most ancient town of Germany. It was the capital of the Celtic Treviri, from whom it took its name (anciently Augusta Trevirorum). The Romans made it a colony and it grew in importance. It was an Imperial residence in the later times of the Roman Empire, which explains the presence of the magnificent Roman relics. Treves had a bishop at a very early date. It fell into the hands of the Franks in the fifth century. The see appears to have been erected into an archbishopric about the beginning of the ninth century. About a century later the city, after having for a time belonged to Lorraine, was permanently united with Germany. It rose to great importance under its archbishops, who exercised temporal sway over a considerable district, and who held a place among the Imperial Electors. After a long struggle with its ecclesiastical overlords, Treves was recognized as a free city toward the close of the sixteenth century. The French took Treves in 1794, and within a few years nearly the whole of the archiepiscopal see was in their possession. The archbishopric was abolished. The Congress of Vienna (1814-15) handed the city and the former see over to Prussia. Consult: Wilmowski, *Der Dom zu Trier* (Treves, 1874); Freeman, *Historical and Architectural Sketches*

(London, 1876); Woerl, *Führer durch die Stadt Trier* (Würzburg, 1887).

TREVI, trā'vē, Fountain of. A noted fountain in Rome, with which the superstition is connected that a traveler's return to Rome is assured by dropping a coin in its basin and drinking its waters. It is built against the façade of the Palazzo Poli and was completed in 1762. The water of the ancient Aqua Virgo spouts from the crevices of the rocks and from the nostrils of the horses of Neptune, who stands in his chariot above the fountain surrounded by Tritons.

TREVIGLIO, trā-vē'lyō. A town in the Province of Bergamo, Italy, 20 miles by rail and by steam tramway east by north of Milan (Map: Italy, D 2). It has an attractive church. There is a library. The town manufactures silks, woolens, ironware, and chemicals. Population (commune), in 1901, 15,138.

TREVISO, trā-vē'zō. The capital of the Province of Treviso, Italy, situated in a fertile valley, on the Sile, 18 miles north by west of Venice (Map: Italy, G 2). It is connected with the lagoons of Venice by a canal. The town has a mediæval appearance with its high walls flanked with bastions. The imposing twelfth-century cathedral, restored in the fifteenth century, has five cupolas. The Gothic Church of San Niccolò has a curious wooden roof, and is adorned with admirable frescoes. The Borgo Cavour contains a library of 50,000 volumes and a picture gallery. Among the educational institutions are a technical school, a school of navigation, a bishop's seminary, and an academy of sciences. The city manufactures silk and woolen goods, metal ware, machinery, chemicals, and paper. Population (commune), in 1881, 31,249; in 1901, 33,987. Treviso, the Roman Tarvisium, was an important city toward the end of the Roman Empire. It figured among the cities of the Lombard League. It came under the rule of Venice in the fourteenth century. In 1797 it was taken by the French under Mortier, who received the title of Duke of Treviso.

TREV'ITHICK, Richard (1771-1833). A British mechanical engineer and inventor, distinguished for his improvements of the steam engine and as the designer of the first practicable locomotive. He was born at Illogan, in Cornwall, and received a common-school education previous to becoming an engineer in the mines in his vicinity. Engaged in the construction of pumping and other engines, he was associated with Murdock, Bull, and other well-known engineers and was constantly experimenting with machinery. He was as well known in his neighborhood for his muscular strength as for his inventive genius. He effected various improvements in pumps and designed a high-pressure steam engine in 1800 which was soon in wide use in the mines of Cornwall and Wales. Turning his attention to the designing of steam vehicles, as early as 1796 he made a number of models on a small scale, and in 1801 completed a full-size vehicle for which he received a patent in the following year. This steam carriage operated so successfully that Trevithick with the assistance of Andrew Vivian was led in 1804 to build a locomotive engine to operate on the Merthyr-Tydfil tram road. This was the first application of steam to the hauling of loads on a railway and led to the construction of further steam locomotives operating on rails, including one which was exhibited in London in 1808 on a circular track. As Trevithick understood that the friction of the wheels on the rails was sufficient for the traction of cars on ordinary grades (in distinction from other inventors who employed a cog and rack), and as he was the first to use a return flue boiler and a steam jet in the chimney, and to couple together the wheels of a locomotive, he is considered by many entitled to the credit of being the real inventor of the locomotive steam engine. It is, however, to Stephenson (q.v.) that we must look for the perfection of a practical application of the machine. See Locomotive, in which article will be found descriptions of Trevithick's locomotives. See also Railways.

After devoting himself to the construction of steam drills and dredging machines he became interested in an unsuccessful attempt to tunnel the Thames, and also carried on experiments on engines suitable for ship propulsion and other purposes. In 1816 Trevithick went to Peru, where a number of his engines had been introduced into the silver mines, and after being successful in several undertakings, lost his entire property through the outbreak of war, which forced him to retire from the country. At Cartagena in 1827 he encountered Robert Stephenson (q.v.), who assisted him to return to England. The remainder of his life was spent in further experiments, few of which came to a successful outcome, and he died in poverty. While Trevithick reaped but little material reward for any of his inventions, yet he made many discoveries which were of the greatest use to other engineers when practically applied and successfully developed. His work for the steam engine stands out conspicuous and ranks him among the most prominent engineers and inventors of the nineteenth century. Consult: Trevithick, *Life of Richard Trevithick* (London, 1872); Smiles, *Lives of Engineers* (ib., 1861).

TRIAD (from Lat. *trias*, from Gk. *τριάς*, number three, triad, from *τρεῖς*, *treis*, three). In music, a chord of three tones built upon any tone with its third and fifth above. According to the character of the intervals the character of the triad varies materially. Thus, C E G consists of a major third + a minor third; C E♭ G of a minor third + a major third; C E G♯ of two major thirds; C E𝄫 G𝄫 of two minor thirds. These triads are known as major, minor, augmented, and diminished triads, respectively. If in four or five part writing one or two tones of a triad are doubled, the character of the triad is not at all affected. See Harmony.

TRIAL (OF. *trial*, from *trier*, to try, choose, thresh, from ML. *tritare*, to thresh, rub, frequentative of Lat. *terere*, to rub, thresh; connected with OChurch Slav. *trieti*, *trŭti*, Lith. *triti*, *trinti*, to rub). A regular and formal examination or inquiry into the material facts of a controversy in issue before a competent tribunal, in order finally to determine the respective rights of the parties thereto. Trials may be divided into two classes: those by a judge and jury, and those before a judge without a jury. In a legal action the trial is usually before a jury. (For the ordinary steps in a jury trial, see Jury.) In courts of equity, trials are conducted before the chancellor or judge without a jury, substantially in the same manner as in a jury trial. The codes of reformed procedure and practice acts in most of the States regulate the details of trials in their various courts. See the articles Evidence; Jury; Pleading; Practice; Nonsuit; Nolle Prosequi; etc., and consult the authorities referred to under Pleading; Evidence; Jury; etc.

TRIAL BY JURY. The first comic opera by Gilbert and Sullivan (1875). Its success was due largely to its allusions to the Tichborne Case (see Tichborne Trial), then at its height.

TRIANGLE (Lat. *triangulus*, three-cornered, from *tres*, three + *angulus*, angle). A figure formed by three intersecting lines. The sides of a *plane* triangle are straight lines, and those of a *spherical* triangle are geodetic lines or arcs of great circles. Triangles are called *equilateral*, *isosceles*, and *scalene* according as three sides, two sides, or no sides are equal. Of two angles of a plane triangle that opposite the greater side is the greater, but the angles do not vary as the sides, the ratio of two sides being equal to that of the sines of the opposite angles. (See Trigonometry.) In a spherical triangle the sines of the sides are proportional to the sines of the opposite angles. The sum of the angles of a plane triangle is 180° according to Euclidean geometry (see Geometry); but in the case of a spherical triangle the sum varies from 0° to 540°. The geometry of the triangle is extensive, and a few of the most important propositions are given under Concurrence and Collinearity, and Maxima and Minima. The area of any plane triangle is given by the formulas $\triangle = \frac{bh}{2}$ and $\triangle = \sqrt{s\ (s-a)\ (s-b)\ (s-c)}$, where b is the base, h the altitude, a, b, c the sides, and s the semi-perimeter. In case the triangle is equilateral, $\triangle = \frac{a^2\sqrt{3}}{4}$, where a is the side. If one angle of a plane triangle is a right angle the triangle is called a right-angled triangle, the side opposite the right angle being the hypotenuse. The *spherical* triangle of one, two, or three right angles is called a rectangular, birectangular, or trirectangular triangle, respectively. The spherical triangle in which one, two, or three sides are quadrants is called a quadrantal, biquadrantal, or triquadrantal triangle, respectively. The area of a spherical triangle is given by the formula $\triangle = \frac{\pi R^2 E}{180}$, where R is the radius of the sphere and E the spherical excess (q.v.), or $A + B + C - 180°$. Consult Catalan, "Quelques formules relatives aux triangles rectilignes," in the *Mémoires couronnés* of the Brussels Academy (1891); Casey, *Sequel to Euclid* (5th ed., Dublin, 1888).

TRIANGLE. A musical instrument consisting of a steel rod bent into a three-sided figure open at one angle. It is hung by a string at the upper angle, and attached to the performer's left hand, to his desk, or to his drums. Modern composers frequently use it in marches, dances, and fantasias. As it is only used for rhythmic figures, the music is written, as for drums and other instruments without fixed pitch, upon a single line.

TRIANGLE SPIDER. A spider (*Hyptiotes cavatus*) of the family Uloboridæ, common in the Eastern United States. Its web is usually stretched between the twigs of dead branches and at first appears like the fragment of an orb web. It consists of four plain radiating lines and a series of double cross-lines. From the apex of the triangle a strong line extends to the supporting twig. The spider stations itself on this line and draws up a slack which when loosened jars the whole web, entangling engaged insects in the cross-threads. Consult Wilder, in *Popular Science Monthly*, 1875.

TRIANGULAR NUMBERS. See Number.

TRIANGULATION. A method used in surveying when the area to be surveyed is of considerable extent. It consists, as the name indicates, in laying out a system of triangles by means of which intermediate points are located. See Surveying.

TRIANON, trē'ȧ'nôɴ'. The name given to two villas in the Park of Versailles. The Grand Trianon was built in 1685 by Louis XIV. for Madame de Maintenon, and is a handsome building, one story in height, containing interesting furnishings. In it the trial of Marshal Bazaine took place in 1873. The Petit Trianon, built by Louis XV. in 1766 for Madame Du Barry, was afterwards a favorite resort of Marie Antoinette. It has a fine English garden with a Temple of Love, a lake, and several rustic cottages.

TRI'AR'THRUS (Neo-Lat., from Gk. *τρεῖς*, *treis*, three + *ἄρθρον*, *arthron*, joint). A genus of Ordovician trilobites with depressed convex carapace of elongate oval outline, of which the middle third is occupied by the broad axis. The thorax has 14 to 16 segments, in the middle of each of which there is a rounded knob, and the pygidium is small and semicircular. The best known species is *Triarthrus Becki* of the Utica shale of North America. See Trilobita.

TRIASSIC SYSTEM (from Lat. *trias*, number three, triad). A group of rocks immediately following the Carboniferous and preceding the Jurassic system. It is therefore the oldest formation of the Mesozoic era. The rocks of this system were at first associated with the Permian under the name of the New Red Sandstone (q.v.), but they were finally separated and designated as the Trias by German geologists, who divided the system into three series, the Keuper, Muschelkalk, and Buntersandstein. The Rhætic clays and sandstones were subsequently added to the system.

Much difficulty has been found in subdividing the American Trias, and still more in correlating it with the European beds. Indeed, in the United States it is often difficult to separate the Triassic from the Jurassic, and consequently the plan adopted by the United States Geological Survey is to designate them as the Jura-Trias, thus considering the deposits as one formation. The American Triassic is subdivided as follows:

	PACIFIC BORDER	ATLANTIC BORDER
TRIASSIC SYSTEM	Bajuvaric Series Tirolic Series Dinaric Series Scythic Series	Newark Series

The Pacific Coast beds are marine, while those of the Atlantic border are estuarine. In the Eastern States the Triassic formation consists of a series of sandstones and shales extending more or less unbrokenly from the Connecticut Valley to South Carolina. The rocks were deposited in shallow water along the continental shores. The Newark rocks are in many places faulted and intruded by igneous rocks, the eruptions having in some cases occurred while the deposition of sediment was still going on, being thus in the nature of submarine outbursts. The Palisades of the Hudson River and the East Rock at New Haven, Conn., are formed of diabase erupted during the Triassic period. Some doubt exists as to whether the Triassic rocks of the Atlantic border were one continuous belt or whether they were deposited in separated troughs. In the interior of the continent along the Rocky Mountains there are extensive beds of red sandstone which were deposited in an inland sea, but whether they belong to the Triassic or Jura-Trias is unsettled. On the Pacific Coast the Triassic rocks have a maximum thickness of nearly 5000 feet. Triassic rocks are known in Central and South America, Europe, Asia, and Australasia.

The plant life of the Triassic included ferns, cycads, conifers, and gigantic representatives of the Equiseta or horsetails. The accumulated remains of these plants contributed to the formation of important coal seams. Among the vertebrates fishes were fairly abundant, the dominant type being ganoids; but the most characteristic class was the Amphibia, which attained its greatest development in this period. Of reptiles the ichthyosaurs, plesiosaurs, dinosaurs, crocodiles, and turtles were present, while the earliest representatives of the Mammalia came into existence.

The Triassic beds of the Atlantic border yield great quantities of sandstone (brownstone) for building, which has been quarried chiefly in the Connecticut Valley and New Jersey. Deposits of coal are found in the Triassic of Virginia and North Carolina and in parts of Europe, but they are of minor importance compared with the great coal measures of the Carboniferous age.

BIBLIOGRAPHY. Kümmel, "The Newark Rocks of New Jersey and New York," *Journal of Geology*, vii., pp. 23-52: Shaler and Woodworth, "Geology of the Richmond Basin, Virginia," *Nineteenth Annual Report of United States Geological Survey*, part ii., p. 325; Russell, "The Newark System," *Bulletin 85, United States Geological Survey;* Darton, "The Relations of the Traps of the Newark System in the New Jersey Region," *Bulletin 67, United States Geological Survey;* Davis, "The Triassic Formation of Connecticut," *18th Annual Report, United States Geological Survey*, part ii., p. 9; Hopkins, "The Brownstones of Pennsylvania," *Bulletin Issued by Pennsylvania State College.* See GEOLOGY; PALEONTOLOGY; etc.

TRIBE (Lat. *tribus*, tribe; possibly connected with *trabs*, beam, Oscan *trübom*, Lith. *trobà*, building, OWelsh, OBret. *treb*, habitation, subdivision of the people, Goth. *þaúrp*, field, OHG. *dorf*, Ger. *Dorf*, Eng. *thorp*, village, or perhaps rather with Lat. *tres*, three, cf. Gk. τριφυής, *triphyēs*, Skt. *tribhu*, threefold, in allusion to the three legendary tribes of early Rome; hardly connected with Gk. ἀτρύγετος, *atrygetos*, unfruitful, or with OChurch Slav. *trŭgŭ*, market-place). In general, an interrelated group, as a group of individuals defined on the basis of relationship; specifically, a consanguineal group of mankind. In savagery the social organization rests on the basis of kinship traced in the female or maternal line. Usually the family comprises the mother with her children. The rôle of the husband and father is often that of a perpetual guest possessing little if any right over property or person; while the several families of sisters (i.e. daughters of the same mother) form a clan of which the mother or elderwoman is the lawgiver and her eldest brother the executive or chief. Commonly several such clans coexist and are united on the basis of real or assumed sisterhood of the elderwomen or on some other basis connected in some way with kinship; and the union constitutes a tribe in the specific sense of the term. Ordinarily the tribe is perpetuated by marital regulations; mating is usually proscribed within the clan, which thereby becomes exogamous, and prescribed within the tribe, which is thereby rendered endogamous, and in more primitive societies, such as that of the Australian natives and that of certain American aborigines, the laws are complex and restrict intermarriage to certain clans and even to a certain order within these clans. While the elderwomen remain lawgivers in the tribe as in the clan, the larger organization requires enlarged executive powers, which are usually vested in elder brothers of the matrons, so that the control is measurably or wholly avuncular. In a still further enlargement of the group by multiplication of families the chiefs assume added prerogatives, and their power may rise above the kinship bonds and may even become hereditary, so that a reigning clan may be established. In the somewhat more advanced culture commonly called barbarism the family and tribal organization undergo a change; paternity is recognized and kinship is traced in the male lines; and commonly the father assumes control of property and person, exercising authority not only over his children, but over his wife or wives. This stage is that of patriarchy with its concomitants of enslavement and polygamy. In the patriarchal condition the group of closely related families forms a gens, while the less closely related gentes are usually organized in a tribe under a common chieftaincy. The organization is perpetuated partly by means of marital customs and partly by means of property regulations, while the chiefship may be determined in various ways; yet the fundamental idea of the social organization or law remains that of kinship or consanguinity, either real or assumed. The chief function of the tribe is military, while that of the clan is juristic. The social organization on this basis is conveniently styled tribal society, in contradistinction from the national society found among peoples organized on a territorial basis. Consult: Morgan, *Ancient Society* (New York, 1877); Maine, *Ancient Law.*

TRI'BONIA'NUS. A distinguished Roman jurist of the sixth century A.D. He was of Macedonian parentage, but was born at Side, in Pamphylia. He held, under the Emperor Justinian (q.v.), the offices of quæstor, master of the Imperial household, and consul. But he is famous chiefly through his labors in connection with the

Code of Justinian and the pandects. Tribonianus died in 545.

TRIBUNE (Lat. *tribunus*, originally a tribal officer, from *tribus*, tribe). In ancient Rome the name tribune was applied to two distinct functionaries, the military tribunes (*tribuni militum*) and the tribunes of the plebs (*tribuni plebis*), which will be considered separately. (1) In the traditional organization of the citizens by Romulus the leader of the quota of warriors furnished by each of the three tribes was called *tribunus militum;* and the same was true when the tribes were increased to four under Servius Tullius, when we read also of *tribuni ærarii*, whose duty it was to collect and pay into the treasury the tribal taxes ('tribute'). Under the Republic each legion was under the command of six military tribunes, at first appointed by the consuls (who were the commanders-in-chief), afterwards elected at the *comitia tributa*. Their importance was greatly diminished at the end of the Republic, when the actual command of the legion in the field was confided to a skilled officer called *legatus legionis*, and the six *tribuni militum* were retained only as an honorary staff of the general. With the formal development of the *cursus honorum*, or regular sequence of offices for men of senatorial rank, the military tribuneship took its place in the preliminary service, as a stepping-stone by which young nobles might reach the higher positions. Under the Empire the name *tribuni* was given also to the officers of each cohort of the prætorian guards, city guards (*cohortes urbanæ*), and night-watch (*vigiles*).

(2) In the early period all the perquisites and prerogatives of government in Rome were in the hands of the patricians, while the plebs, the bulk of the people, had only the burdens of taxation and military service. This galling condition is said to have been partly remedied by the secession of the plebs in B.C. 494, when they secured the right to have annual magistrates, called *tribuni plebis*, chosen from their number to look after their especial interests and needs. These were six in number (at first perhaps five), served for one year, and were reëligible. They were invested with three important privileges: (1) *ius auxilii*, the right to defend a plebeian on any charge; (2) *intercessio*, the right of vetoing any measure proposed by the senate; (3) personal inviolability during their term of office. After B.C. 471 the tribunes were regularly elected by the popular *comitia tributa*. The power and energy of the plebeian tribunes were responsible for the gradual extension of political rights to all the people, and to the struggle between patricians and plebeians that marks the history of the Republic. They caused the codification of the laws ('Twelve Tables') in B.C. 451; the recognition of the popular decrees (*plebiscita*) as binding on all alike, B.C. 449; the right of intermarriage between patricians and plebeians by the *lex Canuleia*, B.C. 445; the successive opening up of the high offices to the plebeians; the Licinian Rogations (q.v.), B.C. 367; and the agrarian agitation of Tiberius and Gaius Gracchus. (See GRACCHUS.) Augustus Cæsar took to himself the power and rights of the tribunes (*tribunicia potestas*), and hence under the Empire the office lost its importance, becoming a function for senators of plebeian rank, held between the quæstorship and the prætorship.

TRIBUTE (Lat. *tributum*, from *tribuere*, to grant, pay, or assign, originally to a tribe, from *tribus*, a tribe). Money, commodities of value, or services rendered by one ruler or State to another in token of submission, as distinguished from taxation, which is the legal imposition of financial burdens by a State upon its own subjects. This distinction cannot be said, however, always to have prevailed, and under the feudal system especially, taxation, tribute, and rent were in many cases identical. This was natural under a system where the political superior was at the same time the owner of the land, and where such land was held largely by military tenure. 'Aids' and 'reliefs' were essentially of the nature of tribute, as also were the tolls and services levied upon the cultivators of the soil by their lords, or exactions like that of heriot (q.v.). See FEUDALISM.

TRICER′ATOPS (Neo-Lat., from Gk. *τρεῖς*, *treis*, three. + *κέρας*, *keras*, horn + *ὤψ*, *ōps*, face). A very interesting fossil reptile, a horned dinosaur of most formidable aspect, of which skeletons are found in the Upper Cretaceous rocks of Colorado, Dakota, Wyoming, and Montana. The animal was about 25 feet long, with heavily built legs and powerful tail. The most peculiar feature is the heavy armature of the massive head. The skull is larger than that of any other known land animal, with a length of six feet and a width across the crest of about five feet. It is wedge-shaped and narrow in front of the small orbits, and expanded behind into a broad solid bony frill or crest which projects far backward over the neck and shoulders, and the edges of which are armed with a row of sharp projections that were covered with horn.

On the facial region of the skull are three horns: a long outward spreading pair over the orbits and a small horn on the nose. The jaws have strong turtle-like beaks on their tips and series of two-rooted teeth placed in sockets in their posterior portions. The brain of this creature was smaller than that of any other known vertebrate, with a ratio to bulk of body of two pounds to ten tons. The feet were three-toed, and the beast walked on all fours and fed on plants. Consult: Zittel and Eastman, *Textbook of Palæontology*, vol. ii. (London and New York, 1902); Marsh, "The Dinosaurs of North America," *Annual Reports of the United States Geological Survey*, vol. xvi., part i. (Washington, 1896); Lucas, *Animals of the Past* (New York, 1901), which contains interesting observations on the habits of Triceratops. See DINOSAURIA.

TRICHIASIS, trĭ-kī′ȧ-sĭs (Neo-Lat., from Gk. *τριχίασις*, from *θρίξ*, *thrix*, *τριχός*, *trichos*, hair). An inversion of one or more eyelashes, their points rubbing against the globe of the eye. It results from cicatricial contraction or long continued inflammation of the eyelids. The symptoms, like those of entropion (q.v.), are caused by irritation of the conjunctiva by the rubbing of the eyelashes. Unlike entropion, however, the inversion of the hairs is not due to inversion of the margins of the lids, which are in their natural position. This affection causes great annoyance, by exciting a pricking sensation, and by the constantly irritated and watery state of the eye which it induces. The treatment consists in plucking out the offending hairs (if they are few in number) from time to time. Electrolysis may be employed. If they form a little group, they must be removed by dissecting out a portion of the lid and uniting the wound with a suture. In other cases it may be necessary to remove the entire margin of the lid.

TRICHINA, trī-kī′nȧ (Neo-Lat., from Gk. θρίξ, *thrix*, hair). A peculiar nematode worm, which, in its sexually immature state, inhabits the muscles of mammals, usually the pig. It was discovered in 1835.

The young trichinæ, as they are seen in human muscle, present the form of spirally coiled worms, in the interior of small, globular, oval, or lemon-shaped cysts, which appear as minute specks scarcely visible to the naked eye. The cysts are sometimes altogether absent, and hence they must be regarded as formations resulting from local inflammation set up by the presence of the worm, which in this larval condition of existence measures about a millimeter long. These larval worms exhibit a well-marked digestive apparatus, and afford evidence of the presence of reproductive organs, which are often sufficiently developed to enable the observer to determine the sex. The number of larval trichinæ that may simultaneously exist in the muscles of a single man or animal is enormous.

When an animal is fed with flesh containing the larval worm and is killed a few days afterwards, a large number of minute worms are found mixed with the contents of the small intestines. On the second day after their introduction these intestinal trichinæ attain their full sexual maturity, and in six days the females contain perfectly developed and free embryos in their interior.

The female is a slender round worm, varying in length from $\frac{1}{12}$ to $\frac{1}{8}$ of an inch. The anterior end presents a bead-like appearance, from which the intestinal canal proceeds. The posterior three-fourths are mainly occupied by the reproductive organ, which is filled partly with free embryos, and partly with eggs in various stages of maturity. The females continue bringing forth young for a period of two or three weeks. The embryos penetrate the walls of the intestine, and pass either through the body cavity or by means of the blood-vessels into the muscles of the host, where, if the conditions are otherwise favorable, they are developed into the encysted form. Some of them reach the muscles of the extremities and other distant parts; but the majority remain in those sheathed muscular groups which are nearest to the cavity of the body (abdomen and thorax), especially in those which are smaller and most supplied with connective tissue. These embryos penetrate into the interior of the separate muscle fibres, and in the course of fourteen days acquire the size and organization of *Trichina spiralis*. In the adult condition trichinæ perish in cold water in about an hour, and cannot survive the decease of their host for more than six hours, but the larvæ remain alive in water for a month, and will live for a long time in flesh which has become putrid. In this way a carcass near a marsh or rivulet may communicate the parasites to the ruminants that drink the water, or to pigs. The formation of the cysts is the cause of more or less serious injury to the host, according to the number present. When abundant, the weakness is very marked and is often fatal. In man infection occurs, almost invariably through the eating of raw or underdone pork containing the cysts. If the meat is properly cooked the worms will be destroyed. Consult Braun, *Die tierischen Parasiten des Menschen* (Würzburg, 1902). See PARASITE, ANIMAL.

TRICHINIASIS, trĭk′ĭ-nī′ȧ-sĭs, or **TRICHINOSIS**, -nō′sĭs (Neo-Lat., from *trichina*, trichina). A disease caused by the ingestion of food containing trichina (q.v.), characterized by a number of puzzling symptoms. The disease was noted by Wormald, who saw the characteristic specks while dissecting; but its cause was demonstrated by Paget and the naturalist Robert Brown, in 1835. But it was reserved for Zenker to demonstrate that trichiniasis caused death. Virchow (q.v.) first propagated the nematode in an animal and demonstrated its presence in the intestine in 1859. Leuckart in the following year presented a full, lucid, and complete solution of the whole question. After being swallowed, the trichina worms traverse the connective tissue and gain access to all parts of the body. They are found, after death, in the muscles of the trunk and head, as well as in the extremities; and most thickly placed in the diaphragm, the intercostals, the muscles of the neck (especially of the larynx) and of the eyes. The intestinal mucus also contains many. The intestinal canal shows catarrhal changes. The mesenteric glands are swollen. The heart muscle is almost invariably free from invasion.

The symptoms of the disease are as follows: On the second or third day after eating the infected meat the patient suffers from nausea, vomiting, colic, and diarrhœa. Constipation may follow. The muscles then become weak, and great weariness is experienced. Between the tenth day and the sixth week the muscles become stiff, of a wooden consistency, and very tender. This condition is most noticeable in the flexors of the extremities, and occasionally the knees or elbows will be bent and rigid. The temperature generally remains normal or is subnormal; rarely it rises. Œdema is characteristic and appears about the seventh day, first in the eyelids and the face, next in the extremities. In the legs it may be extreme. It is probably due to toxins excreted by the parasites. Owing to the invasion of the larynx, hoarseness or aphonia is common, as also dyspnœa, bronchitis, and pneumonia. Profuse sweating is also characteristic. Acne, herpes, and boils may appear on the skin; pruritus is common. Insomnia is a common symptom and is constant in severe cases. Headache occurs if pneumonia be present. Swine suffer principally, among the lower animals; but rats, mice, rabbits, and guinea pigs are easily infected. Horses, cattle, sheep, goats, and dogs are with difficulty infected. It has been stated by some that rats carry the parasites to swine. Cats are occasionally victims of trichiniasis.

It is supposed that the parasite gained access into Europe through the introduction of the Chinese pig early in the nineteenth century. The disease was epidemic in Syria in 1881. It has appeared in Algiers; in South America; in the West and Massachusetts, in the United States;

in France; in Basle, Switzerland; in Malaga, Spain; in Russia, Sweden, Norway, and Denmark; in England in 1871; in North Germany, since 1849, an epidemic occurring in Hettstädt in 1863.

Prophylaxis consists in inspection of swine, after slaughtering, by competent microscopists, who shall take sections from the muscles of mastication, the laryngeal and abdominal muscles, and the diaphragm.

There is no treatment for the disease, and in all probability many non-fatal cases occur which are diagnosed as rheumatism or some acute fever, as well as some cases of pneumonia in which the trichina parasite is the unidentified cause. Consult: Chaten, *La trichine et la trichinose* (Paris, 1883); Leuckart, *The Parasites of Man* (trans. by Hoyle, London, 1886).

TRICHINOPOLI, trĭch'ĭ-nŏp'ô-lĭ. The capital of a district of Madras, British India, on the right bank of the Kaveri, below the island of Srirangam (q.v.), 56 miles from the sea, and 190 miles by rail southwest of Madras (Map: India, C 6). The old town, now inclosed by boulevards, stands at the base and on the rugged slope of a granite rock 273 feet high, crowned by a temple, a much-frequented pilgrimage shrine. The native town is inhabited by a dense population dwelling in low, closely packed huts. The chief building is the former Nawab's palace, now restored and used as Government offices. There are several Protestant missions and a college, and also a Jesuit college. Beyond the boulevards is Saint John's Anglican Church, containing the tomb of Bishop Heber, who died here in 1826; to the south near Golden Rock, a hill about 100 feet high, is the central jail, one of the largest buildings of its kind in Madras. Cheroots are manufactured in large quantities from excellent tobacco grown in the vicinity. Weaving and the manufacture of hardware, cutlery, jewelry, gold chains, harness, and saddlery are extensively carried on. Trichinopoli was governed by a line of rajas that died out in 1732 when it came under the rule of the Nawab of Arcot. It came under British control in 1801 with the rest of the region. Population, in 1891, 90,609; in 1901, 104,690.

TRICHOME (from Gk. *τρίχωμα*, *trichōma*, growth of hair, from *τριχοῦν*, *trichoun*, to furnish with hair, from *θρίξ*, *thrix*, hair). A hair-like outgrowth from the epidermis of plants, usually arising from a single cell. These structures are known variously as hairs, glands, bristles, bladders, scales, prickles, warts, etc., and may be one or many celled. The long hairs on the seeds of cotton are simple and unicellular. The filaments on the stamens of the spider lily (Tradescantia) are multicellular and simple. Branched unicellular hairs may be found on the common shepherd's purse (Capsella) and branched multicellular hairs on mullein. Hairs with flattened expansions at the top are called scales. Glandular hairs are widely distributed among plants, being usually unbranched and with a knob at the apex, which secretes such substances as resins, gums, ethereal oils, mucilage, and sugar. When the substance is secreted in a liquid form it moistens the surface, but when volatile it is recognized as an odor. Root-hairs are one-celled outgrowths from the epidermis of the root, having very delicate walls. Their office is to absorb nutritive materials for the plants. Many plants and organs which bear hairs during early stages of development become smooth as they grow older. Environment also affects the hairiness of a structure. A plant growing in a very dry situation may be hairy, while another individual of the same species growing in a wet situation may be much less hairy or even entirely smooth. Systematists have made large use of the trichome in describing plants, and have developed a large number of descriptive terms.

TRICHOPTERA, trĭ-kŏp'te-rȧ (Neo-Lat. nom. pl., from Gk. *θρίξ*, *thrix*, *τριχ-*, *trich-*, hair + *πτερόν*, *pteron*, wing). An order of insects containing the caddis fly (q.v.).

TRICOLOR (Fr. *tricolor*, from Lat. *tres*, three + *color*, color). Literally a flag in three colors, which is the case in almost every national ensign, but usually restricted in sense to flags having three colors in equal masses. The principal tricolor ensigns are those of France—blue, white, and red, divided vertically; Germany—black, white, and red, divided horizontally; Russia—white, blue, and red, divided horizontally; Italy—green, white, and red; Belgium—black, yellow, and red; and Mexico—green, white, and red; the last three all divided vertically. The French tricolor took its use at the outbreak of the Revolution of 1789, as the badge of the National Guard. The red and blue were selected as the arms of Paris, and the white was added as the color of the army, to show the intimate union which should subsist between the people and the national defenders.

TRICYCLE. See BICYCLE.

TRIDENT (Lat. *tridens*, three-toothed, from *tres*, three + *dens*, tooth). In classic mythology, the attribute of Poseidon, god of the sea. It consists of a staff, armed at one end with three short prongs, with double barbs at the points.

TRIDYMITE (from Gk. *τρίδυμος*, *tridymos*, three-fold, from *τρεῖς*, *treis*, three; so called from its frequent crystallization in groups of three). A mineral silicon dioxide crystallized in the hexagonal system. It resembles quartz, from which it differs, however, in having a lower specific gravity. It occurs chiefly in acidic volcanic rocks and was originally discovered in 1868 in the trachyte of San Cristóbal in Mexico. It has since been found in various localities in Germany, Hungary, and elsewhere. It has been prepared artificially by dissolving a silicate in a bead of phosphorus salt.

TRIENNIAL ACT. A British statute of the reign of William III. (1694), directing that no Parliament should last longer than three years. This period was extended to seven years by the Septennial Act of George I. (1716).

TRIER, trēr. The German name for Treves.

TRIEST, trê-ĕst', or **TRIESTE.** The principal seaport of Austria-Hungary, situated at the northeast extremity of the Adriatic Sea, on the Gulf of Triest, 367 miles by rail southwest of Vienna (Map: Austria, C 4). Triest and the adjoining district form an Austrian crownland, and the city is the general administrative seat of the Austrian Küstenland (q.v.). The city, which is strongly fortified, extends somewhat in the manner of an amphitheatre along the acclivity of the Karst (q.v.). The old town, with its narrow, crooked, and steep streets, lies at the base of the Castle Hill and between it and the gulf. In its northwestern corner, close to the water, is the Tergesteo, whose cruciform arcades, roofed with glass, are used for the exchange. Near by are the two leading squares, the Piazza della Borsa and the Piazza Grande. From this vicinity the Corso, the principal street, extends eastward, separating the old town from the new quarter, where broad avenues lead up toward the inclosing hills. On the west side of the Castle Hill, in the old town, the cathedral occupies a conspicuous site where a Roman temple once stood. It is a composite structure, dating from the fourteenth century. It was formed by joining three ecclesiastical edifices, which had stood there since the sixth century. On the Piazza Grande are the splendid new municipal buildings. Triest has a Museo Lapidario, an open-air museum of Roman antiquities, occupying an old cemetery. The town possesses a nautical academy containing the municipal museum, with Roman antiquities, and the Ferdinand-Maximilian Museum, remarkable for its collection of Adriatic fauna.

Toward the southern end of the city is the Museo Civico Revoltella, in the palace of that name. Near by stands the fine bronze monument to Maximilian of Mexico by Schilling. From this point leading south and following the curve of the gulf extends the Passeggio di Sant' Andrea, affording fine views for more than three miles, and reaching the vast wharves of the Lloyd Company. The public gardens are on the northeast of the city. Among the attractions of Triest is the famous Château of Miramar, situated on the sea to the northwest, which belonged to Maximilian. It has a lovely park and offers beautiful sea views. The city contains a Greek church with rich decorations, a Jesuit church, and a Capuchin convent. There are a university, a royal academy with an observatory, a public library with over 50,000 volumes, and the literary Società della Minerva.

The harbor, the main attraction of Triest proper, has been greatly extended and improved. There are a number of moles and an immense breakwater. The Canal Grande (only 400 yards long) penetrates the city north of the Corso, and permits vessels to load and unload at the warehouses. Triest has a naval arsenal and is the storehouse for the Imperial Navy. Since 1891 the whole town, except the harbor proper, has been inside the customs limit. Triest has of late years found a dangerous rival in the Hungarian port of Fiume, but its commercial preëminence is vigorously supported by the Austrian Government. Nearly 20,000 vessels visited the harbor in 1901, with a total tonnage in and out of 4,560,000, with cargoes valued at $127,000,000. Corn, oil, wine, and many other products are heavily dealt in. The local mercantile fleet is large. At the Austrian Lloyd shops many vessels are annually constructed, and over 3000 men are employed. Triest builds ships of all varieties, and manufactures marine steam engines, cables, furniture, silks and cottons, clothing, liquors, wax-lights, soap, etc. The population in 1900 was 134,143. The Italians largely predominate.

HISTORY. Triest is the Roman Tergeste. It has belonged almost uninterruptedly to Austria since 1382. It was made a free port in 1719 by Charles VI., which date marks the beginning of its importance. It finally became the commercial rival of Venice. Consult: Löwenthal, *Geschichte der Stadt Triest* (Triest, 1857-59); Scussa, *Storia cronografica di Trieste* (ib., 1885-86).

TRIFAIL, trē′fīl. A town in Styria, Austria, on a tributary of the Save, 66 miles southwest of Marburg. Trifail has one of the most productive mines of lignite in Austria. There are large cement, chemical, and glass works. Population, in 1900, 10,851.

TRIFOLIUM. See CLOVER.

TRIFO′RIUM (ML., from Lat. *tres*, three + *foris*, door, opening), or TRIFORIUM GALLERY. The arcade opened up in the wall of the nave of a mediæval church immediately above the vaults of the side aisles and under the line of clerestory windows. The name was derived from the custom of dividing each bay of this gallery into three arches, though this was by no means the constant rule, early galleries having often a single arch and later ones having two, four, or more arches in each bay. The triforium was usually inserted between the summit of the aisle vault and the top of its slanting roof, but in developed Gothic the roof-line was often changed so as to let light into the gallery. While not unknown in Romanesque architecture, this was especially valuable as a feature of Gothic interiors. The earlier Gothic churches had higher galleries, especially in England, on account of the high Norman galleries; and during the thirteenth century the French Gothic diminished their size and usefulness, retaining them mainly for decorative purposes and as blind or semi-blind galleries, whereas at first they could be used by the congregation.

TRIGGER-FISH. One of the fishes of the plectognath family Balistidæ, characterized by an ovate body covered with large rough scales, and the fact that the first spine of the anterior of the two dorsal fins is high and very strong, and may be lifted, when it is locked erect by the spine behind it; whence the name. About fifty species are known, mainly in the Indo-Pacific region, where they become rather large and remain near shore; some are herbivorous, others carnivorous. Their flesh is rarely eaten, as it is reputed poisonous, and in some cases, at least, does produce death with muscular spasms and extreme suffering. Several species of the genus Balistes inhabit the American tropics, of which one, the cicuyo, or leather-jacket (*Balistes Carolinensis*), is very common in the Gulf of Mexico and on our South Atlantic coast, and also in the Mediterranean Sea. See Plate of PLECTOGNATH FISHES.

TRI′GLYPH (Lat. *triglyphus*, from Gk. *τρίγλυφος*, three-grooved, from *τρεῖς*, *treis*, three + *γλύφειν*, *glyphein*, to carve). In the Doric frieze, the projecting block between the metopes (q.v.). It is supposed to represent the ends of the beams in the original structure of wood and crude brick. Its face regularly contains two triangular, vertical furrows, and the edges are chamfered.

TRIGO′NIA (Neo-Lat. nom. pl., from Gk. *τρίγωνος*, *trigōnos*, triangular, from *τρεῖς*, *treis*, three + γωνία, *gōnia*, angle). This genus, represented at the present time by only five species living in the Australian seas, was one of the most important types of lamellibranchs in the Mesozoic seas of Europe. Trigonia appeared first in the Liassic, became very abundant in the Middle and Upper Jura and the Middle Cretaceous, and then in the Tertiary declined in number of species to the present time. The Mesozoic species, some of which are four or five times the size of the living species, are arranged into groups according to the markings of their shells, which are often elaborately sculptured. Consult: Louis Agassiz, *Etudes critiques sur les mollusques fossiles. Mémoire sur les trigonies* (Neuchâtel, 1840); Lycett, "A Monograph of the British Fossil Trigonias," *Palæontographical Society Monographs* (London, 1872-79); Von Zittel and Barrois, *Traité de paléontologie*, part i., vol. ii. (Paris, Munich, and Leipzig, 1887).

TRIG'ONOCAR'PUS (Neo-Lat., from Gk. τρίγωνος, *trigōnos*, triangular + καρπός, *karpos*, fruit). Fossil seed pods and fruits, probably of various kinds of plants, which in cross section have a triangular form. See CARPOLITH; CORDAITES; CONIFERÆ; PALEOBOTANY.

TRIGONOMETRIC SERIES. See SERIES.

TRIGONOMETRY (from Gk. τρίγωνον, *trigōnon*, triangle, from τρεῖς, *treis*, three + γωνία, *gōnia*, angle + -μετρία, *metria*, measurement, from μέτρον, *metron*, measure, from μετρεῖν, *metrein*, to measure). Originally the study of triangles, especially the theory of the measurement of their sides, angles, and areas; now the measure of triangles is merely a part of the general subject. That portion of the subject which deals with the measurement of figures in a plane is called *plane* trigonometry, and that which deals with figures on the surface of a sphere is called *spherical* trigonometry. That branch of the subject which deals with the circular functions of angles is called *goniometry*. The pure theory of trigonometric functions, apart from their application to problems of measurement, is called *analytic* trigonometry. Elementary trigonometry has many useful applications, as in the measurement of areas, heights, and distances. It is indispensable to the study of astronomy, physics, and the various branches of engineering.

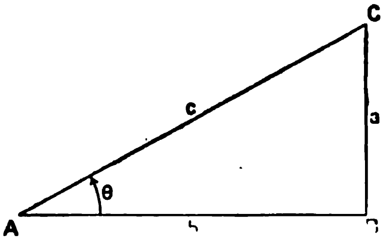


FIG. 1.

The common functions of trigonometry may be defined as ratios of certain sides of a right triangle. Thus, in the figure, the ratio $\frac{a}{c}$ is called the *sine* of the angle θ, commonly written $\sin\theta = \frac{a}{c}$. The ratio $\frac{b}{c}$ is called the *cosine* of the angle θ, written $\cos\theta = \frac{b}{c}$. The other functions are *tangent* of θ, symbolically written $\tan\theta = \frac{a}{b}$; *cotangent* of θ, or $\cot\theta = \frac{b}{a}$; *secant* of θ, or $\sec\theta = \frac{c}{b}$; and *cosecant* of θ or $\operatorname{cosec}\theta = \frac{c}{a}$. There are also used the functions *versine* of θ, or $\operatorname{vers}\theta = 1 - \frac{b}{c}$; and *coversine* of θ, or $\operatorname{covers}\theta = 1 - \frac{a}{c}$. The propriety of calling these ratios 'functions' of the angle θ consists in this, that the value of any ratio depends upon the value of θ. That is, in any right-angled triangle AB′C′, having an acute angle θ, the corresponding ratios $\frac{a'}{c'}, \frac{b'}{c'}, \frac{a'}{b'}$ (Fig. 2) are equal to the ratios $\frac{a}{c}, \frac{b}{c}, \frac{a}{b}$; and in any right-angled triangle in which the acute angle θ' is not equal to θ the corresponding ratios are not equal to those for θ. The trigonometric functions as defined by the above ratios are evidently limited to angles less than 90°, since a triangle contains but one right angle. However, the definition may be extended to angles of any size and the functions expressed by line segments.

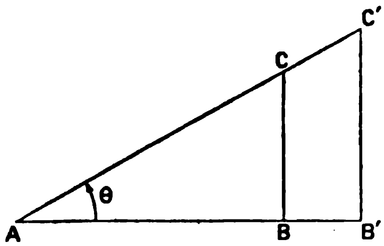


FIG. 2.

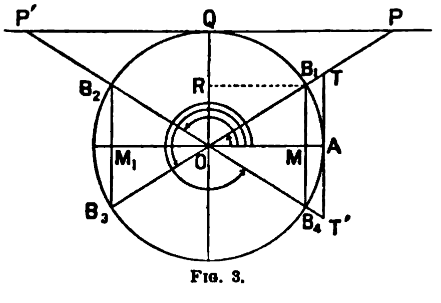


FIG. 3.

In Fig. 3 the radius OA (= OB) may be regarded as the unit of length, hence the ratio $\frac{B_1M}{OB_2} = B_2M_1$ and $\sin AOB_1 = B_1M$. Similarly $\cos AOB_1 = OM$, $\tan AOB_1 = AT$, $\cot AOB_1 = PQ$, $\sec AOB_1 = OT$, $\operatorname{cosec} AOB_1 = OP$, $\operatorname{vers} AOB_1 = MA$, and $\operatorname{covers} AOB_1 = QR$. If the angle is obtuse as AOB_2, or reflex as AOB_3, AOB_4, the functions are represented by the corresponding lines. E.g. $\sin AOB_3 = B_3M_1$, $\tan AOB_4 = AT'$. The following convention of signs (see Fig. 4), however, serves to associate these values with the proper angle: Lines measured to the right of the vertical diameter, as OM, are called positive, and those to the left, as OM_1, negative; lines measured upward, as B_1M, from the horizontal diameter are called positive, and those downward, as M_4B_4, negative; the revolving radius OB_1 is always positive. Thus (see Fig. 4) the signs of the functions of an angle not exceeding 90° are all plus. The versine and coversine are evidently always positive. The sine and the cosecant are positive in the first and second quadrants, and negative in the third and fourth. The cosine and the secant are positive in the first and fourth quadrants and negative in the second and third. The tangent and cotangent are positive in the first and third quadrants, and negative in the second and fourth. We have, therefore, the following relations:

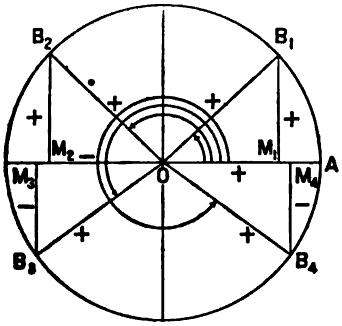


FIG. 4.

$$\begin{aligned} \sin(-a) &= -\sin a \\ \cos(-a) &= \cos a \\ \tan(-a) &= -\tan a \\ \cot(-a) &= -\cot a \end{aligned}$$

For the definition of a negative angle, see ANGLE.

A given value of a function does not, however, uniquely determine the angle, as will appear from the following table of relations:

FIRST QUADRANT

$$\begin{array}{l|l} \sin(90^\circ-\theta)=\cos\theta & \tan(90^\circ-\theta)=\cot\theta \\ \cos(90^\circ-\theta)=\sin\theta & \cot(90^\circ-\theta)=\tan\theta \end{array}$$

SECOND QUADRANT

$$\begin{array}{l|l} \sin(180^\circ-\theta)=\sin\theta & \sin(90^\circ+\theta)=\cos\theta \\ \cos(180^\circ-\theta)=-\cos\theta & \cos(90^\circ+\theta)=-\sin\theta \\ \tan(180^\circ-\theta)=-\tan\theta & \tan(90^\circ+\theta)=-\cot\theta \\ \cot(180^\circ-\theta)=-\cot\theta & \cot(90^\circ+\theta)=-\tan\theta \end{array}$$

THIRD QUADRANT

$$\begin{array}{l|l} \sin(180^\circ+\theta)=-\sin\theta & \sin(270^\circ-\theta)=-\cos\theta \\ \cos(180^\circ+\theta)=-\cos\theta & \cos(270^\circ-\theta)=-\sin\theta \\ \tan(180^\circ+\theta)=+\tan\theta & \tan(270^\circ-\theta)=\cot\theta \\ \cot(180^\circ+\theta)=+\cot\theta & \cot(270^\circ-\theta)=\tan\theta \end{array}$$

FOURTH QUADRANT

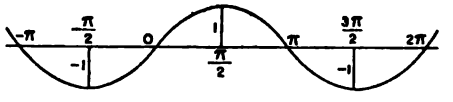
$$\begin{array}{l|l} \sin(360^\circ-\theta)=-\sin\theta & \sin(270^\circ+\theta)=-\cos\theta \\ \cos(360^\circ-\theta)=\cos\theta & \cos(270^\circ+\theta)=\sin\theta \\ \tan(360^\circ-\theta)=-\tan\theta & \tan(270^\circ+\theta)=-\cot\theta \\ \cot(360^\circ-\theta)=-\cot\theta & \cot(270^\circ+\theta)=-\tan\theta \end{array}$$

Thus to express the trigonometric functions of angles greater than 90° in terms of those of angles less than 90°, determine first the sign of the function to be so expressed, next subtract from the angle whatever multiple of 90 is necessary to make it less than 90°. If an even multiple of 90° is subtracted the name of the original function is retained, but if an odd multiple is subtracted the original function is replaced by the *co-named* function. E.g. to express $\cos(270^\circ-\theta)$ in terms of a function of θ. This angle is in the third quadrant and therefore its cosine is negative. To make the angle $270^\circ-\theta$ less than 90° we must subtract 180° and we have $\cos(270^\circ-\theta) = -\cos(90^\circ-\theta)$. But $\cos(90^\circ-\theta) = \sin$, and we have $\cos(270^\circ-\theta) = -\sin\theta$.

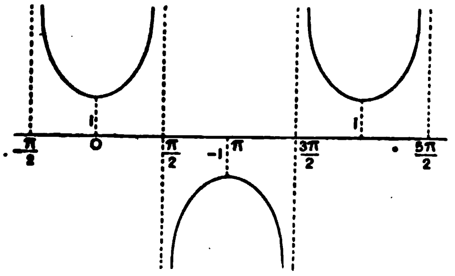
The increasing of an angle by 360° or any multiple of 360° does not alter the value of the trigonometric functions of that angle. (See FUNCTION.) It appears from the geometric representation of the functions that the values of the sines and cosines of all real angles lie within the interval $+1, -1$; the values of the tangents and cotangents of all real angles lie within the interval $+\infty$ and $-\infty$; those of the secants and cosecants without the interval $+1, -1$, as is shown in the following table:

FUNCTION	0°	90°	180°	270°	360°
Sine	0	1	0	— 1	0
Cosecant	∞	1	— ∞	— 1	∞
Cosine	1	0	— 1	0	1
Secant	1	∞	— 1	— ∞	1
Tangent	0	∞	0	— ∞	0
Cotangent	∞	0	— ∞	0	∞

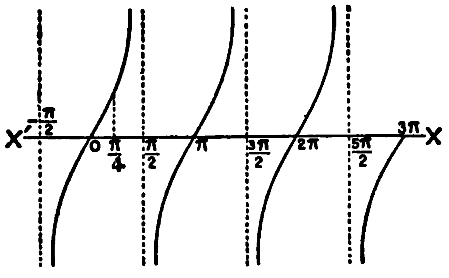
The variations of the functions are best exhibited by means of graphs. In the figures the arcs are laid off as abscissas and the functions as ordinates. See COÖRDINATES.



GRAPH OF SIN θ.



GRAPH OF SEC θ.



GRAPH OF TAN θ.

From the definition of the trigonometric functions, it is evident that they bear certain relations one to another. Some of the fundamental ones are, $\sin^2\theta + \cos^2\theta = 1$, $\sin\theta \csc\theta = 1$, $\cos\theta \sec\theta = 1$, $\tan\theta \cot\theta = 1$, $\tan = \sin\theta/\cos\theta$, $1 + \tan^2\theta = \sec^2\theta$, $1 + \cot^2\theta = \csc^2\theta$, from which many others readily follow. Besides these relations existing between the functions of a single angle, there are those connecting the functions of several angles. Thus

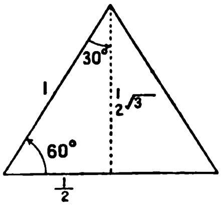
$$\sin(A \pm B) = \sin A\cos B \pm \cos A\sin B,$$
$$\cos(A \pm B) = \cos A\cos B \mp \sin A\sin B,$$
$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B},$$
$$\cot(A \pm B) = \frac{\cot A \cot B \mp 1}{\cot A \pm \cot B};$$

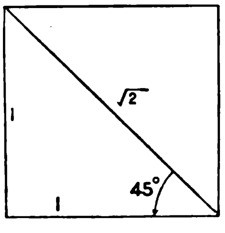
and $\sin 2A = 2 \sin A \cos A$, $\cos 2A = \cos^2 A - \sin^2 A$, $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$, and $\cot 2A = \frac{\cot^2 A - 1}{2 \cot A}$, which are easily derived from the corresponding formulas for $A + B$ by putting $A = B$. Some of the formulas for functions of half an angle are: $\sin \tfrac{1}{2}A = \pm\sqrt{\frac{1 - \cos A}{2}}$, $\cos \tfrac{1}{2}A = \pm\sqrt{\frac{1 + \cos A}{2}}$, $\tan \tfrac{1}{2}A = \pm\sqrt{\frac{1 - \cos A}{1 + \cos A}}$, and $\cot \tfrac{1}{2}A = \pm\sqrt{\frac{1 + \cot A}{1 - \cot A}}$. By reapplying these formulas it is evident that functions of 3A, 4A, ... nA may be expressed as functions of A and also as functions of various fractional parts of A.

To every function there is an inverse function or anti-function just as to every logarithm there is an antilogarithm. The formula to express the angle whose sine is x is $\sin^{-1} x = \theta$, read "θ is the angle whose sine is x." Similarly $\tan^{-1} y = \theta$ is read, "θ is the angle whose tangent is y," or "anti-tangent of y equals θ." All inverse functions admit of translation into the direct formulas. Thus $\sin^{-1} x = \theta$ reduces to $\sin\theta = x$, and $\tan^{-1} = y = \theta$ to $\tan\theta = y$. All inverse or anti-functions can be expressed in series, as in the case of the functions. (See SERIES.) The following will serve as examples:

$$\sin^{-1} x = \frac{x}{1} + \frac{1}{2}\cdot\frac{x^3}{3} + \frac{1\cdot3}{2\cdot4}\cdot\frac{x^5}{5} + \cdots + \frac{1\cdot3\ldots\ldots(2r-1)}{2\cdot4\ldots\ldots\ 2r}\,\frac{x^{2r+1}}{(2r+1)} + \ldots\ldots$$

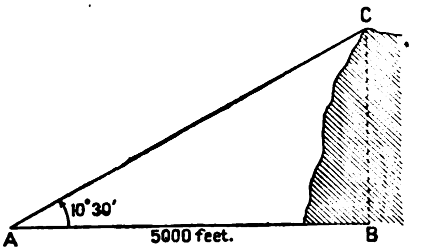
$$\tan^{-1} x = \frac{x}{1} - \frac{x^3}{3} + \frac{x^5}{5} - \ldots\ldots + (-1)^n\frac{x^{2n-1}}{2n-1} + \ldots\ldots$$

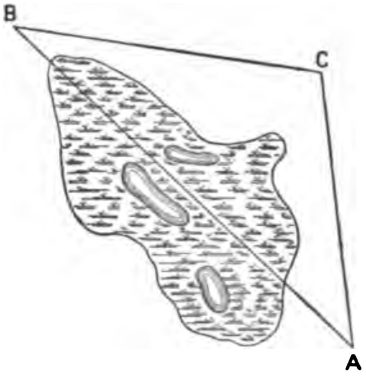




The values of the functions of certain angles may be calculated by reference to geometric figures, but the tables of such values for all angles have been calculated to a close degree of approximation by means of the trigonometric series. The equilateral triangle serves to exhibit the values of the functions of 60° and 30°. If the side be taken as 1, the figure shows that $\sin 60° = \tfrac{1}{2}\sqrt{3}$, $\cos 60° = \tfrac{1}{2}$, $\tan 60° = \sqrt{3}$, and so on. Similarly the functions of 45°, as $\sin 45° = \cos 45° = \frac{1}{\sqrt{2}} = \tfrac{1}{2}\sqrt{2}$, may be obtained from the square.

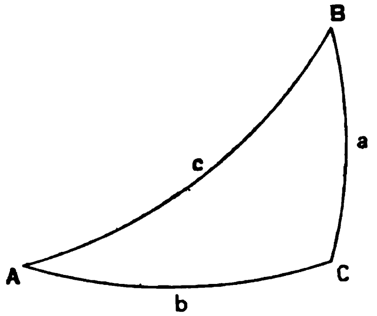
The following problems will serve to illustrate the use of trigonometry in practical mensuration: (1) Required the height of a hill above the horizontal plane of an observer, the distance of the observer from the point below the summit being 5000 feet and the angle of elevation 10° 30′. The height of the hill, represented by BC in the figure, is given by the equation BC = tan10° 30′ 5000 feet = 0.1853 × 5000 feet = 926.5 feet, tan10° 30′ being taken from a table of natural tangents. (2) Required the distance between two points A and B separated by an impassable swamp, the line AC, as represented in the figure, being 15 chain lengths, the angle A 40° 15′, and the angle C 110° 32′. The length of the line AB is given by the equation $AB = \frac{AC\sin 110°\ 32'}{\sin 150°\ 47'} = \frac{15\cdot 0.9365}{0.4881} = 28.5$, the sines of the angles being taken from a table of natural sines. Therefore AB is 28.5 chain lengths.

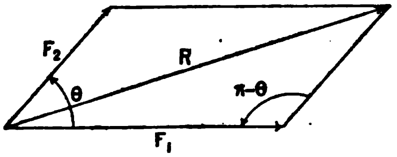


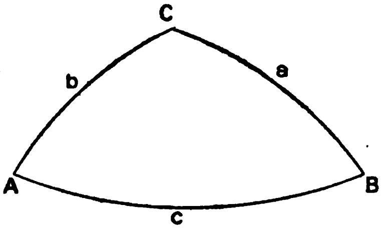


From the expressions of e^x, $\sin x$, $\cos x$ (see SERIES), it follows that $e^{ix} = \cos x + i \sin x$ (see COMPLEX NUMBER), and that $e^{-ix} = \cos x - i \sin x$; whence by adding and subtracting, $\cos x = \frac{e^{ix} + e^{-ix}}{2}$, $\sin x = \frac{e^{ix} - e^{-ix}}{2i}$. Similarly the other functions may be expressed in terms of e^{ix}, e^{-ix}. These are the exponential expressions for the circular functions of x. If i is omitted from these exponentials, the resulting functions are called the *hyperbolic* cosine, *hyperbolic* sine of the angle x. Hyperbolic functions are so called because they have geometric relations with the equilateral hyperbola analogous to those between the circular functions and the circle. The common notation for such functions is $\sinh\theta$, $\cosh\theta$, $\tanh\theta$, corresponding to the circular function $\sin\theta$, $\cos\theta$, $\tan\theta$. The values of these functions have been tabulated and are of service in analytic trigonometry.

The spherical triangle, like the plane triangle, has six elements, the three sides a, b, c, and the angles A, B, C. But the three sides of the spherical triangle are angular as well as linear magnitudes. The triangle is completely determined when any three of its six elements are given, since there exist relations between the given and the sought parts by means of which the latter may be found. In the right-angled or quadrantal triangle, however, as in the case of the right-angled plane triangle, only two elements are necessary to determine the remaining parts. Thus, given c, A, in the right-angled triangle, ABC, the remaining parts are given by the formulas $\sin a, = \sin c, \sin A$, $\tan b = \tan c, \cos A$, $\cot B = \cos c, \tan A$. The corresponding formulas when any other two parts are given may be obtained by Napier's rules concerning the relations of the five circular parts (q.v.), viz. a, b, complement of A, complement of B, complement of c. In the case of oblique triangles no simple rules have been found, but each case is dependent upon the appropriate formula. Thus in the oblique triangle ABC, given a, b, and A, the formulas for the remaining parts are $\sin B = \dfrac{\sin A \sin b}{\sin a}$, $\tan \frac{1}{2} c = \tan \frac{1}{2} (a - b) \cdot \dfrac{\sin \frac{1}{2}(A + B)}{\sin \frac{1}{2}(A - B)}$, $\cot \frac{1}{2} C = \tan \frac{1}{2} (A - B) \cdot \dfrac{\sin (a + b)}{\sin (a - b)}$.







It is evident in spherical trigonometry, as well as in plane, that three elements taken at random may not satisfy the conditions for a triangle, or they may satisfy the conditions for more than one. The treatment of the *ambiguous cases* in spherical trigonometry is quite formidable, since every line intersects every other line in two points and multiplies the cases to be considered. The measurement of spherical polygons may be made to depend upon that of the triangle. For, if, by drawing diagonals, the polygons can be divided into triangles each of which contains three known or obtainable elements, then all the parts of the polygon can be determined. Since the elements of the spherical polygon measure the elements of the polyhedral angle whose vertex is at the centre of the sphere, the formulas of spherical trigonometry apply to problems involving the relations of the parts of such figures. E.g., given two face angles and the included dihedral angle of a trihedral angle, the remaining face and dihedral angle may be determined by the same formulas as apply to the corresponding case of the spherical triangle. By aid of the formulas of spherical trigonometry the theories of transversals, coaxal circles, poles and polars, may be developed for the figures of the sphere. Spherical trigonometry is of great importance also in the theory of power circles, stereographic projection, and geodesy. It is also the basis of the chief calculations of astronomy; e.g. the solution of the so-called astronomical triangle is involved in finding the latitude and longitude of a place, the time of day, the azimuth of a star, and various other data.

Some traces of trigonometry exist in the earliest known writings on mathematics. In the Papyrus of Ahmes (see AHMES) a ratio is mentioned called a *seqt*, and because of its relation to the methods of measuring the pyramids, this ratio seems to correspond to the cosine or the tangent of an angle. But to the Greeks are due the first scientific trigonometric investigations. The sexagesimal division of the circle was known to the Babylonians, but Hipparchus was the first to complete a table of chords. Heron (q.v.) computed the values of $\cot \frac{2\pi}{n}$, for $n = 3, 4, \ldots 11, 12$, and calculated the areas of regular polygons. Thirteen books of Ptolemy's *Almagest* were given to trigonometry and astronomy. The Hindus contributed an important advance by introducing the half chord for the whole chord as used in the Greek calculations. They were familiar with the sine and calculated ratios corresponding to the versine and cosine. The sine, however, first appears in the works of the Arab Al-Battani (q.v.), and to his influence is due the final substitution of the half for the whole chord. Al-Battani knew the theory of the right-angled triangle and gave the relation $\cos a = \cos b \cos c + \sin b \sin c \cos A$ for the spherical triangle. The celebrated astronomer Jabir ibn Aflah, or Geber, wrote a work confined chiefly to spherical trigonometry, and rigorous in its proofs, which was translated into Latin by Gerhard of Cremona. Regiomontanus (1436-1476) wrote a complete plane and spherical trigonometry. Vieta (1540-1603) made an important advance by the introduction of the idea of the reciprocal spherical triangle. To Napier are due the formulas since called the analogies. Gunter introduced the term *cosine* and Finck (1583) introduced *secant* and *tangent*. Growing out of the desire to construct more accurate tables and to simplify the methods of calculation for astronomical purposes, there was evolved by Napier and Byrgius (q.v.) the idea of the logarithm (q.v.). To Euler much is due for simplifying and classifying the treatment of the whole subject. Lagrange, Legendre, Carnot, Gauss, and others expanded the theory of polygonometry and polyhedrometry. The nineteenth century has contributed the so-called projective formulas, and made further generalization of formulas known before. A few leading works on the subject are: Casey, *A Treatise on Plane Trigonometry* (Dublin, 1888); id., *Treatise on Spherical Trigonometry* (ib., 1889); McClelland and Preston, *Spherical Trigonometry* (London, 1890); Helmes, *Die Trigonometrie* (Hanover, 1881); Wittstein, *Trigonometrie* (ib., 1887); Hobson, *Plane Trigonometry* (Cambridge, 1891); Chauvenet, *Plane and Spherical Trigonometry* (New York, various editions). For the history of the subject, consult Braunmühl, *Beiträge zur Geschichte der Trigonometrie* (Halle, 1897), and his *Vorlesungen über Geschichte der Trigonometrie* (Leipzig, vol. i., 1900; vol. ii., 1903). For reference to valuable tables, see the article on LOGARITHMS.

TRIISODON, trī'ī'sō-dŏn (Neo-Lat., from Gk. *τρεῖς*, *treis*, three + *ἴσος*, *isos*, equal + *ὀδούς*, *odous*, tooth). A fossil creodont mammal from the Puerco beds of New Mexico. The skull is the oldest known mammalian skull. Consult Matthew, "Additional Observations on the Creodonta," in *Bulletin of American Museum of Natural History*, vol. xiv. (New York, 1901). See CREODONTA; MAMMALIA.

TRIKALA, trē-kä'lȧ, or **TRIKKALA**. A town of Greece, capital of the Nomarchy of Trikala, situated on the Trikkalinos River, 37 miles northwest of Larissa and on the Volos-Kalabaka Railway (Map: Greece, C 2). It manufactures cotton, woolen stuffs, leather, and dye products. Its population in 1889 was 14,820, mostly Wallachs. Trikala is the ancient Trikka, which was celebrated for its temple of Æsculapius.

TRIKOUPIS, trē-ko͞o'pĭs, CHARILAOS (1832-96). A Greek statesman, son of Spiridon Trikoupis, born at Nauplia, July 23, 1832. He studied jurisprudence in Athens and Paris and in 1852 entered the diplomatic service as attaché to the legation at London, where in 1863 he became chargé d'affaires. In 1865 he conducted the negotiations with Great Britain regarding the cession of the Ionian Islands. Elected to the Boulé in the same year, he became an adherent of the radical party, was in 1866 appointed Minister of Foreign Affairs, became Premier in 1875, was once more Minister of Foreign Affairs under Canaris, in the coalition Ministry of 1877, and Premier again in 1880, 1882-85, 1886-90, 1891-93, and 1893-95, when, owing to the financial embarrassment of the Government, he met with a crushing defeat, losing even the seat in the Boulé, which he had held for thirty years. While on his death-bed he was reëlected by the District of Valtos. He died at Cannes, France, April 11, 1896. His endeavors to raise the economic conditions of the country, by the enactment of agrarian and tariff legislation and the building of railways, met with little success. For a number of years his party continued to bear the name of Trikoupists. A volume of his speeches, *Λόγοι πολιτικοί*, appeared at Athens in 1888. Compare Tsokopoulos, *Βιογραφία Χαριλάου Τρικούπη* (Athens, 1896).

TRIKOUPIS, SPIRIDON (1788-1873). A Greek author and statesman. He was the son of a primate of Missolonghi, where he was born, April 20, 1788. He studied in France and England, became secretary of the Earl of Guilford during his occupancy of the position of Governor of the Ionian Islands, and played an important part in the war for independence. After 1821 he was employed in administrative and diplomatic business, being a member of the provisional Government in 1826, and of the National Convention at Trœzen in the following year. He was president of the Council and Minister of Foreign Affairs in 1832; was thrice sent to London (1835-38, 1841-43, and 1850-61) as Ambassador; was Minister of Foreign Affairs and of Public Instruction in 1843; vice-president of the Senate (1844-49); and Envoy Extraordinary to Paris (1850) on the occasion of the blockade of the ports of Greece by England. He died February 24, 1873, at Athens. His funeral oration on Lord Byron (whose friend and comrade he had been), delivered in the Cathedral of Missolonghi, some days after the poet's death, was translated into several European languages. Many other orations, partly religious and partly political, were collected and published (Paris, 1836). His masterpiece is the history of the Greek revolution, *Ἱστορία τῆς Ἑλληνικῆς Ἐπαναστάσεως* (London, 1853-57).

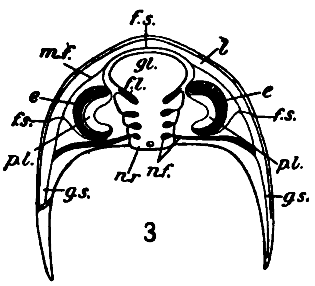
TRIL'BY. (1) A romance by Charles Nodier (1822). (2) A novel by George du Maurier (1895) and its chief character, a beautiful artists' model, whose love for 'Little Billee' and domination by the hypnotic powers of Svengali form the plot of the story. The novel is full of reminiscences of Parisian artist life and gained a wide popularity.

TRILL (Fr. *triller*, It., ML. *trillare*, to trill, probably onomatopoetic in origin). In music, an embellishment produced by the continued and rapid repetition of one note alternately with another, either a whole tone of semitone above it. Its sign is *tr* placed over or under the principal note. The trill was known and used at the end of the sixteenth century, but its name was added considerably later.

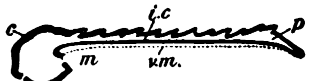
TRILLIUM (Neo-Lat., from Lat. *tres*, three, so called from the symmetrical arrangement of the three outer and three inner segments). A genus of about a dozen species of North American perennial herbs of the lily family growing in moist and shady (not marshy) grounds from

COMMON WAKE-ROBIN (*Trillium erectum*).

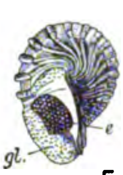
REPRESENTATIVE TRILOBITES



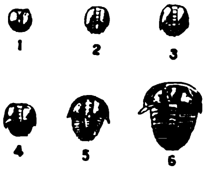
3



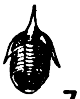
4



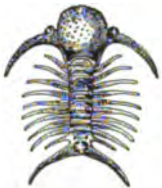
5



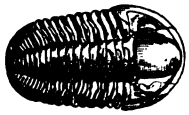
6



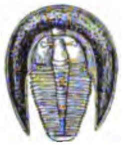
7



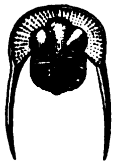
8



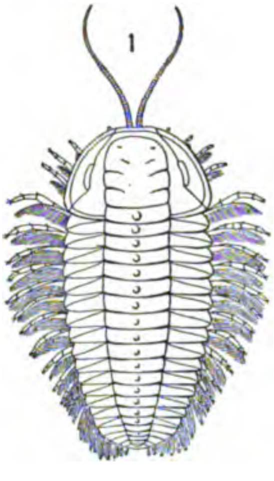
9

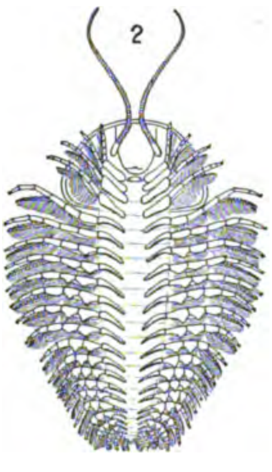


10

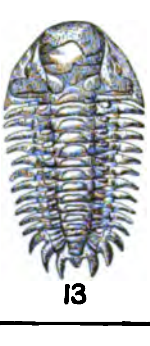


11

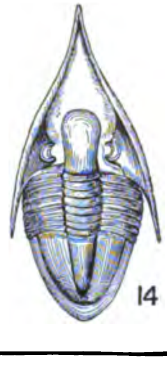




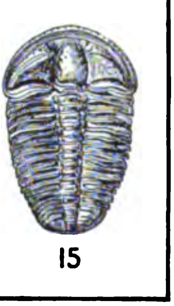
12



13



14



15

For names and description, see text.

Maine to Florida. They have a naked stem, 4 to 15 inches high, terminated by three ovate, pointed, broad, beautifully netted-veined leaves. *Trillium grandiflorum,* also called wake-robin, is a pretty wild flower, growing in rich woods from Vermont to Kentucky, Wisconsin, and northward. The flowers, which appear in spring, are at first nearly white, but change with age to rose-color. They are borne on a peduncle from 2 to 3 inches long.

TRILOBITA (Neo-Lat. nom. pl., from Gk. *τρεῖς, treis,* three + *λόβος, lobos,* lobe). An important group of extinct marine crab-like animals, whose fossil body shields are found in rocks of Paleozoic age in most parts of the world. The trilobites constitute a subclass of Crustacea, of which class they are very primitive members. The trilobite body was covered by a hard, calcareous dorsal shield and a thin ventral integument. The dorsal shield or carapace is of elliptical or oval outline and is divided by two dorsal furrows into three longitudinal lobes, the median axis and two lateral pleural lobes. This trilobate division, which characterizes this class of animals, gave the group its name. The shield is also divided into three transverse parts: the anterior head-shield or cephalon, the median thorax consisting of several movable segments, and the posterior abdominal shield or pygidium. The cephalon is generally of semicircular outline, and the posterior lateral corners, known as the genal angles, are often produced into spines. The more elevated median portion of the cephalon is the glabella, and this is separated from the cheeks or lateral portions by the usually well-marked dorsal furrows. The surface of the glabella is broken up into a series of lobes by three pairs of transverse furrows, called the lateral furrows. The paired lobes are called the lateral lobes and the unpaired anterior lobe, which is often very prominently developed, is known as the frontal lobe of the glabella. The cheeks are traversed in most trilobites by a sinuous line, the facial suture, along which the lateral portions or free cheeks break away from the fixed cheeks.

The eyes, which in most trilobites are of reniform shape, are situated upon the cheeks. In some species (as Acidaspis mira) the eyes are placed at the summits of high immovable peduncles; certain genera, as Agnostus, Microdiscus, and Ampyx, are totally blind; and other genera (as Trinucleus) have eye spots in their young stages and are totally blind when adult. Two types of eyes are present—compound, situated on the free cheeks, and simple eye spots, ocelli or stemmata. The compound eyes are made up of lenses, which may vary in number from 14 in Trimerocephalus to 15,000 in Remopleurides. The facial suture varies largely in its course across the cephalon, not only in the different species and genera, but also in the individuals that represent different stages of development of a single species. Its position in the adult furnishes an excellent diagnostic character. In most trilobites a groove, called the occipital furrow, runs near to and parallel with the posterior margin of the cephalon, and cuts off the occipital lobe from the glabella.

The thorax is made up of several transverse segments which articulate with one another in such manner that some trilobites were able to roll themselves up into a ball after the manner of the armadillo. The number of segments of the thorax is usually constant in the adults of each genus, but it varies within the subclass from two in Agnostus to 29 in Harpes. The pygidium, or caudal shield, is a solid plate formed by the union of several segments, of which traces are still evident in the ribs of its convex dorsal surface. The axis and the pleural ribs are usually present, but in some species of Asaphus and Illænus they are almost entirely suppressed. The trilobite carapace is generally ornamented by small tubercles. Many genera have smooth or punctate tests; others have the test marked by concentric wrinkles; and in other genera spines are developed.

VENTRAL SURFACE. As a rule the ventral surface of the trilobite body is so closely united with the rock matrix that it is only through exceptionally favorable modes of fossilization that anything at all has been learned about the nature of the ventral integument and the appendages. The principal organ on the under side of the head is a rather prominent plate, the upper lip or hypostome, which articulates with the anterior margin of the cephalon, and which protected the small mouth opening situated at its posterior end. Each segment of the carapace, excepting the hindermost anal segment, bears a pair of appendages. The foremost pair, arising near the sides of the hypostome, are simple slender whip-like antennæ, much like those of the higher Crustacea. All the other appendages are biramous; their endopodites are six-jointed crawling legs, and their exopodites are many-jointed feathery organs that probably served both for swimming and respiration. The basal joint of the cephalic limbs form jaw-like organs about the mouth.

DEVELOPMENT. The ontogeny of several genera of trilobites is known. Small rounded bodies supposed to be the eggs of trilobites have been found. Those species of which continuous series of growth stages have been studied are found to originate in a minute 'protaspis' stage and to attain their adult shape through a series of progressive changes expressed in the successive molts, in much the same manner as do the

REPRESENTATIVE TRILOBITES.

1. Dorsal view of a trilobite (*Triarthus Becki*), a species whose perfect specimens preserved in the Utica slate (Ordovician), near Rome, N. Y., have yielded most of the known facts as to the external structure and appearance of these animals. 2. Ventral view of the same. 3. Cephalic shield (cephalon) of *Dalmanites Hausmanni* (Devonian): *l*, limb or border; *m.f.*, marginal furrow; *g.s.*, genal spines; *g l.*, glabella; *f.l.*, frontal lobe, beneath which are seen the 'side lobes' and 'side furrows' of the glabella; *n.f.*, occipital furrow; *n.r.*, occipital ring; *f.s.*, facial suture; *e*, visual surface of eye; *p.l.*, palpebral lobe. 4. Median antero-posterior vertical section of a trilobite (*Ceraurus pleurexanthemus*): *c*, cephalon, with hypostoma below it; *p*, test of the abdomen (pygidium); *m*, mouth; *v.m.*, ventral membrane; *i.c.*, intestinal canal. 5. A trilobite (*Phacops latifrons:* Devonian), rolled up; *gl*, glabella; *e*, eye. 6. Development (ontogeny) of a trilobite (*Sao hirsuta;* Cambrian): 1, 1st larval stage (protaspis); 2-6, successive 'nepionic' stages of development. 7. *Ampyx nasuta* (Ordovician). 8. *Delphon Forbesi* (Silurian). 9. *Proetus Bohemicus* (Silurian). 10. *Harpes ungula* (Ordovician). 11. *Trinculeus Goldfussi* (Ordovician). 12. Profile view of *Sphærexochus mirus* (Silurian). 13. *Cheirurus insignis* (Silurian). 14. *Megalaspis extenuata* (Ordovician). 15. *Conocoryphe Sulzeri* (Cambrian) without the free 'cheeks.' (After Zittel.)

crabs, and other Crustacea. The protaspis is a circular or ovate shield, generally less than one millimeter in length, with a slightly segmented median axis and an indistinctly marked abdominal portion. Growth of the animal takes place through increase in the number of segments and through increase in size in the successive molts, and each new segment is intercalated between the cephalon or the last formed segment and the anterior edge of the pygidium.

Classification. The form and mode of development of the free cheeks are made the principal features of the classification proposed by Beecher, who divides the subclass into three orders: *Hypoparia* are the most primitive forms of trilobites, mostly small in size, without compound eyes, and with simple eye spots in the higher genera. They have the free cheeks ventral or overlapping on the dorsal surface and cutting therefrom a narrow margin together with the genal angles. To this order belong Agnostus and Microdiscus (Cambrian), Harpes (Ordovician to Devonian), Trinucleus (Ordovician), and Ampyx (Ordovician to Silurian). *Opisthoparia* have the free cheeks dorsal, separate and carrying the genal angles. This group includes a large number of genera ranging from Cambrian to Carboniferous, but the majority of them are found in the Cambrian and Ordovician rocks. The primitive genera of the family Conocoryphidæ have rudimentary eyes or are blind; in all others the compound eyes are usually well developed. The more primitive Conocoryphidæ present characters which are exhibited in the larval stages of the more specialized later members of the order. The families and principal genera are as follows: *Conocoryphidæ:* Conocoryphe, Ctenocephalus, Atops, Bathynotus (Cambrian). *Olenidæ:* Paradoxides, Olenellus, Eurycare, Olenus, Ptychoparia, Agraulos, Ellipsocephalus, Sao, Dikellocephalus (Cambrian); and Remopleurides and Triarthrus (Ordovician). *Asaphidæ:* Asaphus, Ogygia, Nileus, Æglina (Ordovocian), and Illænus (Ordovician to Silurian). *Proëtidæ:* Arethusina (Ordovician), Proëtus (Ordovician to Carboniferous), Phillipsia, and Griffithides (Carboniferous). *Bronteidæ:* Bronteus (Ordovician to Devonian). *Lichadidæ:* Lichas (Ordovician to Silurian) and some of its subgenera, ranging from Ordovician to Devonian. This family contains some of the most specialized as well as the largest trilobites. The family *Acidaspidæ* contains a number of species, mostly of small size, ranging from the Ordovician to the Devonian, which are remarkable because of their excessive development of spines. They are most abundant in the Silurian and Lower Devonian. The genera are: Acidaspis, Odontopleura, Selenopeltis, Dicranurus, Ancyropyge. In the order *Proparia* the free cheeks do not carry the general angles and they are often united in front of the glabella. The other orders had their origin in pre-Cambrian time, for they appear in the early Cambrian with their diagnostic features fully differentiated and with a considerable degree of evolution, but the Proparia originated during the late Cambrian and were initiated in the early Ordovician. The order reached its maximum evolution during the Ordovician and declined during the Silurian and Devonian. The members of the family *Encrinuridæ* recall in the form of their cephalon the more primitive members of the Opisthoparia, and like them they have narrow marginal free cheeks, which do not, however, include the genal angles. The principal genera are Encrinurus (Ordovician to Silurian), Placoparia, Cybele, and Dindymene (Ordovician). *Calymmenidæ* includes only Calymmene and Homalonotus (Ordovician to Devonian). *Cheiruridæ* is an interesting family that begins in the Ordovician and ranges into the Devonian and is represented by a large number of species. The principal genera are: Amphion (Ordovician), Ceraurus, Sphærexochus, Staurocephalus (Ordovician to Silurian), Deiphon and Onycopyge (Silurian). *Phacopidæ* is a large family containing perhaps the most highly organized members of the subclass. The frontal lobe of the glabella is large in all genera and in the successive species in each race there is a general tendency toward coalescence or obsolescence of the lateral lobes of the glabella, and an increased prominence of the frontal lobe. The eyes are well developed and have large distinct facets. The family includes Phacops (Silurian to Upper Devonian), Pterygometopus (Ordovician), Acaste and Chasmops (Ordovician to Silurian), Trimerocephalus (Silurian to Devonian), Dalmanites (Ordovician to Devonian), and a number of subgenera.

Habits. Trilobites appear to have been entirely marine animals, and to have enjoyed various modes of existence. Some were undoubtedly bottom crawlers, others buried themselves in the mud of the bottom, and still others were free swimmers or crawled about coral and hydroid masses after the manner of the modern isopods. The remains of trilobites are usually found in dismembered condition, and entire carapaces are quite rare. This is probably due to the fact that the majority of specimens are the discarded molts which have been broken in the process of shedding. Trilobites abound in all the Cambrian formations, during which period they were in fact the dominant forms of life, and they are abundant in some horizons of the Ordovician and Silurian. During the Devonian they declined rapidly, and only a few genera, represented by rare specimens, continued into the Carboniferous. They are entirely absent from all Mesozoic rocks, and they have no near relatives at the present day. They are one of the most important groups of fossil animals for purposes of correlation. In all about 2000 species and over 200 genera have been described, the majority of them from the Cambrian and Ordovician rocks.

Bibliography. Zittel and Eastman, *Textbook of Palæontology*, vol. i. (New York and London, 1900); Barande, *Système silurien du centre de la Bohème*, vol. i. and *Supplement* (Prague, 1852-1872); Salter, "A Monograph of the British Trilobites," *Palæontographical Society Monographs* (London, 1864); Hall and Clarke, *Palæontology of New York*, vol. vii. (Albany, 1888); Bernard, "The Systematic Position of the Trilobites," *Quarterly Journal of the Geological Society*, vols. c. and ci. (London, 1894-1895); Beecher, various papers in *American Geologist*, vols. xiii., xv., xvi. (Minneapolis, 1894-95), and in *American Journal of Science*, 3d ser., vols. xcvi., xcvii., and ser. 4, vol. i. (New Haven, 1893-95); Beecher, "The Ventral Integument of Trilobites," *American Journal of Sci-*

ence, ser. 4, vol. xiii. (1902); "Outline of a Natural Classification of Trilobites," vol. iii. (1887); Jaekel, "Beiträge zur Beurtheilung der Trilobiten," in *Zeitschrift der deutschen geologischen Gesellschaft*, vols. liii. and liv. (Berlin, 1901-02); Reed, "Notes on the Evolution of the Genus Cheirurus," *Geological Magazine, Decade IV.*, vol. iii. (London, 1896); Schmidt, "Revision der Ostbaltischen Silurischen Trilobiten," *Mémoires de l'Académie Impériale des Sciences de Saint-Pétersbourg*, 7th series, vols. xxx., xxxiii., xlii., ser. 8, vol. vi. (Saint Petersburg, 1881-98); Vogdes, "A Classed and Annotated Bibliography of the Palæozoic Crustacea," *California Academy of Sciences, Occasional Papers*, vol. iv., supplement to same in vol. v. (San Francisco, 1893-95).

TRILOGY (from Gk. *τριλογία*, *trilogia*, group of three dramas, from *τρεῖς*, *treis*, three + *λόγος*, *logos*, word). The name given by the Greeks to a group of three tragedies, often connected by a common subject and representing different stages or phases of the same story. A satyric drama was customarily added as a termination, whence the whole was sometimes termed a *tetralogy*. A tragic poet who wished to take part in one of the Athenian poetic contests had to produce a trilogy along with a satyric drama at the great Dionysiac, Lenæan, or Anthesteriac festival. We possess only one perfect specimen of the classic trilogy—the *Oresteia* of Æschylus, which embraces the *Agamemnon*, the *Choephoræ*, and the *Eumenides*. Consult: Welcker, *Die Aeschyleische Trilogie*, etc. (Darmstadt, 1824); Franz, *Des Aeschylos Oresteia* (Leipzig, 1846); Campbell, *The Oresteia of Æschylus*, trans. and introd. (London, 1893).

TRIM, CORPORAL. The voluble and devoted servant and companion of Uncle Toby in Sterne's *Tristram Shandy*.

TRIMBLE, trĭm'bl, ROBERT (1777-1828). An American jurist, born in Berkeley County, Virginia (now West Virginia). He was admitted to the Kentucky bar in 1803 and subsequently was elected to the Legislature. In 1808 he was appointed second judge of the Court of Appeals, in 1810 Chief Justice of Kentucky, and in 1813 United States district attorney. From 1816 to 1826 he was district judge of Kentucky, and from 1826 until his death a justice of the United States Supreme Court.

TRIMETHYLAMINE (from *tri-* + *methyl* + *amine*), $(CH_3)_3N$. An organic base with an extremely powerful and disagreeable fishy odor. It is obtained as a colorless gas, readily soluble in water, and having a strong alkaline reaction. With acids it readily forms soluble salts. It is obtained by distillation from ergot of rye, from guano, from the juice of the leaves of red beetroot, and from putrid yeast. It may be formed artificially by the action of methyl iodide on dimethylamine; but the source from which it may most readily be derived is herring brine. See AMINES.

TRIM'MER, Mrs. SARAH (1741-1810). An English author, daughter of John Joshua Kirby of Ipswich, a close friend of Gainsborough. Settling with her parents in London, she met James Trimmer of Brentford, whom she married in 1762. Mrs. Trimmer was one of the pioneers in founding Sunday-schools. Her first schools were opened at Brentford in 1786, and were so successful that she was summoned by the Queen to Windsor to help start others there. In 1787 she also established at Brentford a school of industry for girls. Soon after this she introduced into the Sunday-school the plan of teaching by prints now in almost universal use. Among her books are *Easy Introduction to the Knowledge of Nature* (1782; 11th ed. 1802); the books with pictures and explanations which after a large circulation were issued as *New and Comprehensive Lessons* (1814; 5th ed. 1830); and the *Abridgements of the Old and New Testaments*, which, issued separately by the Society for Promoting Christian Knowledge in 1793, reached a sale of a quarter of a million copies.

TRIMORPHOUS. See ISOMORPHISM.

TRIMURTI, trē-mōōr'tē (Skt. *trimūrti*, triple form). The name of the Hindu triad of the gods Brahma (q.v.), Vishnu (q.v.), and Siva (q.v.), when regarded as an inseparable unity of creation, preservation, and destruction, though three in form. The concept is relatively late, and cannot be older than the fifth or sixth century A.D. It is probable that the gods Vishnu and Siva were first associated as representatives of the two great Hindu sects (see SAIVAS; VAISHNAVAS), and that Brahma was added at a later time, as he was a later philosophical concept. The basal idea of this triad must not be confused, as is sometimes the case, with that of the Christian Trinity (q.v.), since the three Hindu deities are entirely distinct from each other. In Indian art the Trimurti is one body with three heads: in the middle, that of Brahma; at the right, that of Vishnu; and at the left, that of Siva. The symbol of the Trimurti is the mystic syllable *ōm* (q.v.).

TRIN'COMALEE', or **TRINCOMALI**, trĭṉ'kō-mä'lē. A seaport town on the northeastern coast of Ceylon, 99 miles northeast of Kandy (Map: India, D 7). It is situated on an elevated and precipitous peninsula on the north side of the fine harbor of Trincomalee, the best in Ceylon. Trincomalee is chiefly important as a naval station. The Temple of the Thousand Columns, now in ruins, was erected by the Malabars and destroyed by the Portuguese in 1622. It is still a famous place of pilgrimage of the Hindus. Near the ruins rises Fort Frederick, which was built by the Portuguese from the old material of the temple. Population, in 1901, 13,000. Trincomalee was one of the last towns to surrender to European authority. It was held successively by the Portuguese, Dutch, and French, and surrendered to the British forces after a naval siege of three weeks in 1795. Consult Cave, *The Ruined Cities of Ceylon* (London, 1900).

TRIN'IDAD', *Sp. pron.* trē'nē-däd'. A British West Indian island, belonging to the Windward group, situated close to the mouth of the Orinoco (Map: West Indies, R 9). Area, 1754 square miles. The surface is generally flat. The northern part, however, is traversed by several parallel mountain chains running from east to west and from 600 to over 3000 feet high. The island is well watered. In the southwestern part is the famous pitch lake of La Brea, which yields asphalt for export. The flora is remarkable for its variety and beauty. Trinidad may be considered agriculturally one of the most successful of the British possessions in the West Indies. Originally sugar was the leading product of the soil. With the decline of the sugar industry the planters of Trinidad turned their attention to the cultivation of cacao, which is at present the staple of the island. Sugar is still cultivated to a large extent, the exports of that article for 1901 being valued at £452,210. Besides cacao and sugar, Trinidad produces coffee, cocoanuts, and various kinds of fruit. Commercially it occupies the foremost position among the British West Indian Islands. In 1901 the total value of the trade exceeded the sum of £5,091,000, about equally divided between exports and imports. The island has about 80 miles of railway. Trinidad, together with Tobago (q.v.), is administered by a Governor assisted by an executive council of 7 members and a legislative council of 20 members, all nominated by the Governor. Education is largely subsidized by the Government. The finances of the island are in good condition, the budget balancing at about £650,000. The revenue is derived chiefly from customs receipts. The public debt of the colony amounted in 1902 to £992,286. The population was 255,148 in 1901. It consists chiefly of the descendants of the slaves imported from Africa by the sugar planters. There is also a considerable number of coolies, while the whites form an insignificant part of the population. Port of Spain, the capital of Trinidad, had a population in 1901 of 54,100. Trinidad was discovered by Columbus in 1498 and was originally colonized by the Spaniards, who, however, soon abandoned it. In the eighteenth century Spain renewed her interest in Trinidad, but was soon expelled by Great Britain, to whom it was formally ceded in 1802, in accordance with the Treaty of Amiens. Consult: Fraser, *History of Trinidad* (London, 1894); Eversley, *The Trinidad Reviewer* (ib., 1900); Fiske, *History of the West Indies* (New York, 1899); Root, *The British West Indies and the Sugar Industry* (London, 1899).

TRINIDAD. A small, rocky, and uninhabited island situated in the South Atlantic Ocean in latitude 20° 31′ S., longitude 29° 20′ W., about 750 miles east by north of Rio de Janeiro (Map: World, Western Hemisphere, M 18). It now belongs to Brazil.

TRINIDAD. A town in Cuba, in the Province of Santa Clara, situated about 45 miles southeast of Cienfuegos and 5 miles from its port, Casilda (Map: Cuba, F 5). It is within easy reach of three ports and is of considerable commercial importance. It is one of the most healthful places on the island. Coffee, formerly the chief article of export, is gradually giving place to sugar. Trinidad was founded by Velazquez in 1513, and on account of the repeated attacks by buccaneers was removed from the coast to its present site. Population (municipal district), in 1899, 24,271.

TRINIDAD. The county-seat of Las Animas County, Col., 90 miles south of Pueblo; on the Denver and Rio Grande, the Atchison, Topeka and Santa Fe, and the Colorado and Southern railroads (Map: Colorado, E 3). It has a public library, Saint Joseph's Academy, and Saint Raphael's Hospital. Trinidad is the centre of large cattle-raising and farming interests, and is extensively engaged in coal-mining. There are also railway shops and bottling works. The government is vested in a mayor, chosen every two years, and a unicameral council. The water-works are owned and operated by the municipality. Population, in 1890, 5523; in 1900, 5345.

TRINITARIANS (from *trinity*, Lat. *trinitas*, number three, trinity, from *trinus*, threefold, from *tres*, three). The name most commonly applied in English to the members of the Order of the Holy Trinity for the Redemption of Captives, a Roman Catholic religious society founded by Saint John de Matha (1160-1213) and Saint Felix of Valois (1127-1212). Devoted to the work of freeing Christian captives among the infidels, they soon received the approbation of Pope Innocent III. and the permission of Philip Augustus to settle in France. The headquarters of the Order were fixed at Cerfroy, near La Ferté-Milon, in the present Department of Aisne, and the Pope gave them a second convent in Rome. Their first journey resulted in the liberation of 186 captives, who were brought to Paris amid great rejoicings. While Felix remained at home, caring for the Order's development, John made numerous journeys to North Africa and the coast of Spain. Later, the Trinitarians erected houses for the care of penniless captives after their release, and some of them accompanied the Crusaders to minister to their spiritual needs; they penetrated even to India and Tartary in search of the objects of their charity. It is estimated that in six centuries at least 900,000 prisoners recovered their freedom through the work of this Order.

The Order spread rapidly, first through France and Spain, until in the fifteenth century it counted 880 houses; the number diminished from various causes until at the beginning of the eighteenth century there were only 250. The present members are chiefly occupied with other works of mercy, especially the care of the sick, although in the nineteenth century they devoted considerable labor to the work for negro slaves. Besides several branches, due to various reforms, among the male Trinitarians, there were also two female branches, and a third Order of associates who labored for the cause and had a simple rule of life adapted to persons living in the world. Consult: Carlier, *Les Trinitaires de la rédemption* (Lille, 1866); Père Calixte de la Providence, *Vie de Saint Félix de Valois* (3d ed., Paris, 1878); id., *Vie de Saint Jean de Matha* (2d ed., ib., 1884); id., *Corsaires et Rédempteurs* (Lille, 1884).

TRINITY. A port of entry on Trinity Bay, Newfoundland, the capital of Trinity District, 61 miles northwest of Saint John's (Map: Newfoundland, G 4). It has important fishing industries and a fine harbor. The bay is the landing point of the Atlantic cables. Population, in 1901, 1459.

TRINITY. A river of Texas, formed by the union, near Dallas, of the two forks which rise near the northern boundary of the State (Map: Texas, G 4). It flows southeast through a fertile and well-timbered region, and empties into Galveston Bay about 40 miles north of the

[illegible] afer
[illegible]
[illegible] which
[illegible] n: (1)
[illegible] Hague
[illegible] having
[illegible] conquests
[illegible] luded in
[illegible] Holland
[illegible] Austria
[illegible] lliance. (3)
[illegible] ustria-Hun-
[illegible] ince the be-
[illegible] Germany
[illegible] on October 7,
[illegible] stance in the
[illegible] either party to
[illegible] ality in case of
[illegible] This dual alli-
[illegible] about three years
[illegible] The treaty be-
[illegible] ided for common
[illegible] ments on either
[illegible] Italy and Austria-
[illegible] of a friendly neu-
[illegible] ilities between France
[illegible] in and Austria-Hun-

[illegible], Fr. *triple*, from Lat.
[illegible] music, a group of three
[illegible] med in the time of two
[illegible] regular rhythm. For in-
[illegible] note is divided into *three*
[illegible] p is called a triplet, and it
[illegible] figure 3 over it.

[illegible] vilayet of the Ottoman Em-
[illegible] ne northern coast of Africa,
[illegible] Barca and the Libyan desert
[illegible] on the west, and the desert
[illegible] the south, on which side the
[illegible] y indefinite (Map: Africa, F 2).
[illegible] half is the country called Tripoli
[illegible] ern half is Fezzan (q.v.). The
[illegible] itania, including Barca (the mutes-
[illegible] engazi), is in round numbers about
[illegible] are miles. The interior of Tripoli
[illegible] and sandy, with fertile spots along
[illegible] The country is exposed to the clouds
[illegible] om the deserts. The coasts are mostly
[illegible] sandy, with the exception of the north-
[illegible] part, where some of the mountains
[illegible] n altitude of nearly 2000 feet. Tripoli
[illegible] permanent rivers, but there are
[illegible] iderable number of springs, and the dry
[illegible] courses fill up during the rainy season.
[illegible] limate is hot during the summer, but it has
[illegible] of a Mediterranean than African character.
[illegible] ring the winter the coasts are occasionally
[illegible] red with snow, while in the interior the win-
[illegible] is marked by copious rains. In its flora and
[illegible] una Tripoli resembles the rest of the countries
[illegible] n the northern coast of Africa. Owing to the
[illegible] rcity of productive land and its small popu-
[illegible] lation, Tripoli is very little developed.

Agriculture is carried on only to a limited
[illegible] tent. More attention is paid to stock-raising.
The chief agricultural products are wheat, dates,
[illegible], and olives. Sheep are raised on a large
[illegible] and cattle are also to some extent. Some
[illegible] ur and salt are obtained near the coast, and there are small sponge fisheries. The commerce was formerly very considerable, and the port of Tripoli was once an important outlet for the products of the interior, with which it is connected by numerous caravan routes. The chief domestic exports are wool, oil, and cattle, while from the interior of Africa come gold, ostrich feathers, ivory, rubber, and a few other African products. The imports from Europe consist chiefly of manufactures. The centre of foreign commerce is Tripoli, the capital (q.v.). The annual value of the commerce is in the neighborhood of $4,000,000 annually.

Tripoli, including Barca, is divided into four provinces, administered by beys, who are appointed by the Governor. The latter is appointed by the Sultan, and is intrusted with extensive powers. The Turkish Government maintains a considerable military force, necessitated by the frequent political outbreaks. The population is estimated at from 800,000 to 1,000,000. It consists largely of Berbers and Moors, the latter living mostly in the cities. The Turkish element outside of the official circles is very limited. The official language is Arabic.

HISTORY. Tripoli appears early to have formed a portion of the territory of the Carthaginians. It next passed to the Romans, who included it within the Province of Africa, and gave it the name of *Regio Syrtica*. About the beginning of the third century A.D. it became known as the *Regio Tripolitana* (on account of its three principal cities, Œa, Sabrata, and Leptis, which were leagued together; whence its present name Tripoli), and was probably raised to the rank of a separate province by Septimius Severus, who was a native of Leptis. Later it passed into possession of the Vandals and Greeks. In the seventh century it was conquered by the Arabs (see BARBARY STATES), and the feeble Christianity of the natives was supplanted by a vigorous and fanatical Mohammedanism. In 1510 the city of Tripoli was captured by Ferdinand the Catholic, from 1530 to 1551 it was in possession of the Knights of Saint John. Since 1551 the country has formed part of the Turkish Empire, though the authority of the Sultan, down to 1835, had been virtually at zero for more than a century. During this period Tripoli was a piratical stronghold. In consequence it was attacked by successive expeditions of the English and the French. In 1801-5 it was involved in an unsuccessful war with the United States, and in 1815 an American expedition exacted reparation for injuries done to American commerce. (See BARBARY POWERS, WARS WITH THE.) In 1835 an expedition was dispatched from Constantinople; the ruling bey, Karamanli (in whose family the sovereignty had continued uninterrupted since 1714), was overthrown and imprisoned; a new Turkish pasha, with viceregal powers, was appointed, and the State made a vilayet of the Ottoman Empire. Several rebellions have since taken place (notably in 1842 and 1844), but they have always been suppressed.

BIBLIOGRAPHY. Fournel, *La Tripolitaine* (Paris, 1887); Borsari, *Geografia della Tripolitania* (Naples, 1888); Thompson, *Life in Tripoli* (Liverpool, 1894); Cowper, *The Hill of the Graces* (London, 1897); Jago, "Report on Agriculture and Other Natural Resources of the are occupied, several honorary fellows and lecturers, a chaplain, college officers, sixteen scholars, three Millard scholars in natural science, nine exhibitioners, and four Ford students, and in all about 190 undergraduates. The buildings are of various dates and are arranged in a most attractive open quadrangle. The college presents to ten livings. Among the distinguished men who have been connected with Trinity may be mentioned Archbishop Sheldon, Bishop Seth Ward, Ludlow and Ireton of Civil War fame, Thomas Warton the poet and critic, Cardinal Newman, the elder Pitt, Lord North, Landor, Stubbs, Freeman, George Rawlinson, and Bryce.

TRINITY COLLEGE. An institution at Hartford, Conn., founded by members of the Protestant Episcopal Church in 1823 as Washington College, the present name being assumed in 1845. The college offers four courses, leading to the degrees of B.A., B.S., and B.L. It also offers graduate courses leading to the degree of M.A. and M.S. There is a system of alternative and elective studies, most of the work of the last three years being elective. It has no professional schools, but offers courses in civil engineering. The productive endowment in 1903 was $760,000, with a gross income of $135,000. The library in that year contained 45,130 volumes and 28,185 pamphlets. The students numbered 126 and the faculty 23. The total value of buildings and grounds is about $1,250,000.

TRINITY COLLEGE. An institution at Durham, N. C., founded in 1859, affiliated with the Methodist Episcopal Church, South. The college confers but two degrees, Bachelor of Arts and Master of Arts. The courses are arranged according to the group system with partially elective studies. The teachers and officers in 1903 numbered 25 and there were 231 academic students. The college grounds of 73 acres, with the buildings and equipment, were valued in 1903 at $534,000. The total college property was valued at $975,750, the endowment was $441,750, and the income $40,000.

TRINITY HALL. A college at Cambridge, England. It was founded in 1350 by William Bateman, Bishop of Norwich, and co-founder of Gonville and Caius College, under the name of the College of the Scholars of the Holy Trinity of Norwich, for a master and thirty scholars, devoted to the canon and civil law. It continues to be the peculiarly legal college of the university. By the new statutes in force since 1882, the college consists of a master, thirteen foundation fellows, and one professorial fellow. There are also college officials, two law students, seven scholars, and three exhibitioners, and, in all, about two hundred undergraduates. The college presents to seven livings. Among the distinguished members of the college have been Bishop Stephen Gardiner (Master); Glisson, the anatomist; Lord Howard of Effingham; Chesterfield; Thomas Bilney; and Chief Justice Cockburn.

TRINITY SUNDAY. The Sunday immediately following Whitsunday, so called as being set aside for the special honor of the Trinity. No such festival was known to the early centuries; the general establishment of Trinity Sunday as a common festival of the whole Western Church dates from a decree of John XXII., who died in 1334. Nevertheless, the mass and office peculiar to the day are of much greater antiquity, and may be traced, at least in part, in several liturgical books of the earlier centuries.

TRINO′DA NECES′SITAS (ML., threefold necessity). Three forms of assessment of lands for public purposes during the Anglo-Saxon era. No lands, either in secular or religious hands, were exempt from these three duties, which were known as *bridge-bot*, for the maintenance of bridges and highways; *burg-bot*, for the erection of and keeping fortresses in repair; and *fyrd*, for the support of the King's military and naval forces. Blackstone mentions that in the time of Henry II. no less than 1115 castles were in existence as a result of the tax for the establishment and maintenance of strongholds. Consult Blackstone, *Commentaries*.

TRINUCLEUS, trī′nū′klē-ŭs (Neo-Lat., from Lat. *tres*, three + *nucleus*, little nut, kernel, nucleus). A genus of trilobites characteristic of the middle and upper Ordovician rocks of North America and Europe. The body is small, seldom exceeding an inch in length, with a relatively large and broad horseshoe-shaped headshield. The glabella is convex and consists of a prominent median and two less elevated lateral lobes, and the head is bordered by a wide pitted margin and provided with long, sometimes bifurcated, genal spines. The creature was blind in its adult stages, though in some forms the young were provided with simple eyes (ocelli), and compound eyes, such as are seen in most trilobites, are entirely absent. The thorax has six segments with narrow axis, and the pygidium is small and of broadly triangular form. Trinucleus concentricus is very common in the Trenton series of North America. See TRILOBITA.

TRINUM′MUS. A comedy by Plautus (about B.C.194), founded on Philemon's *Thesauros*. It introduces no female characters. The play was imitated by Lessing in his *Schatz*.

TRIO (It., musical composition in three parts). In music, in a general sense, a composition for three voices or for three instruments. In instrumental music a trio is usually understood to mean a composition written for piano, 'cello, and violin. But it is better to apply the name piano trio. A string trio is generally written for violin, viola, and 'cello, or two violins and 'cello. In a specific sense the term trio is used to denote a middle section in minuets, marches, or scherzi. It derived its name from the fact that the older composers employed three-part writing in this middle section.

TRIONAL $(CH_3)(C_2H_5)C(SO_2C_2H_5)_2$. A white crystalline compound used as a hypnotic. It is prepared by the action of methyl-ethyl ketone (a substance similar to acetone) upon mercaptan (q.v.) and the oxidation of the resulting product by permanganate of potassium. It is readily soluble in alcohol, but sparingly in water. It is an excellent and harmless hypnotic, and especially if administered in connection with a mild purgative is sure to have no injurious after effects. Its advantage over other hypnotics lies principally in the fact that its use does not lead to an organic habit and that its dose does not have to be gradually increased. Like sulphonal (q.v.), it is best administered with hot milk. It is prompter in its action and safer than sulphonal.

TRIPITAKA. See PITAKA.

TRIPLE ALLIANCE. The name by which three different European leagues are known: (1) The alliance concluded in 1668 at The Hague between England, Holland, and Sweden, having for its object the checking of the conquests of Louis XIV. (2) An alliance concluded in 1717 between England, France, and Holland against Spain. With the accession of Austria in 1718 it became the Quadruple Alliance. (3) The *Dreibund* between Germany, Austria-Hungary, and Italy, which has existed since the beginning of 1883. An alliance between Germany and Austria-Hungary was formed on October 7, 1879, on the terms of mutual assistance in the case of an attack by Russia on either party to the alliance, and friendly neutrality in case of an attack by any other power. This dual alliance became a triple alliance about three years later with the accession of Italy. The treaty between Italy and Germany provided for common action in case of French encroachments on either power, and that between Italy and Austria-Hungary for the maintenance of a friendly neutrality in the event of hostilities between France and Italy or between Russia and Austria-Hungary.

TRIPLET (from *triple*, Fr. *triple*, from Lat. *triplus*, threefold). In music, a group of three equal notes, to be performed in the time of two of like value, in the regular rhythm. For instance, when a quarter note is divided into *three* eighth notes, the group is called a triplet, and it is usual to place the figure 3 over it.

TRIP'OLI. A vilayet of the Ottoman Empire, situated on the northern coast of Africa, and bounded by Barca and the Libyan desert on the east, Tunis on the west, and the desert of Sahara on the south, on which side the boundary is very indefinite (Map: Africa, F 2). The northern half is the country called Tripoli and the southern half is Fezzan (q.v.). The area of *Tripolitania*, including Barca (the mutessarriflik of Bengazi), is in round numbers about 400,000 square miles. The interior of Tripoli is elevated and sandy, with fertile spots along the wadis. The country is exposed to the clouds of sand from the deserts. The coasts are mostly low and sandy, with the exception of the northeastern part, where some of the mountains attain an altitude of nearly 2000 feet. Tripoli has no permanent rivers, but there are a considerable number of springs, and the dry river courses fill up during the rainy season. The climate is hot during the summer, but it has more of a Mediterranean than African character. During the winter the coasts are occasionally covered with snow, while in the interior the winter is marked by copious rains. In its flora and fauna Tripoli resembles the rest of the countries on the northern coast of Africa. Owing to the scarcity of productive land and its small population, Tripoli is very little developed.

Agriculture is carried on only to a limited extent. More attention is paid to stock-raising. The chief agricultural products are wheat, dates, grapes, and olives. Sheep are raised on a large scale, and cattle are also to some extent. Some sulphur and salt are obtained near the coast, and there are small sponge fisheries. The commerce was formerly very considerable, and the port of Tripoli was once an important outlet for the products of the interior, with which it is connected by numerous caravan routes. The chief domestic exports are wool, oil, and cattle, while from the interior of Africa come gold, ostrich feathers, ivory, rubber, and a few other African products. The imports from Europe consist chiefly of manufactures. The centre of foreign commerce is Tripoli, the capital (q.v.). The annual value of the commerce is in the neighborhood of $4,000,000 annually.

Tripoli, including Barca, is divided into four provinces, administered by beys, who are appointed by the Governor. The latter is appointed by the Sultan, and is intrusted with extensive powers. The Turkish Government maintains a considerable military force, necessitated by the frequent political outbreaks. The population is estimated at from 800,000 to 1,000,000. It consists largely of Berbers and Moors, the latter living mostly in the cities. The Turkish element outside of the official circles is very limited. The official language is Arabic.

HISTORY. Tripoli appears early to have formed a portion of the territory of the Carthaginians. It next passed to the Romans, who included it within the Province of Africa, and gave it the name of *Regio Syrtica*. About the beginning of the third century A.D. it became known as the *Regio Tripolitana* (on account of its three principal cities, Œa, Sabrata, and Leptis, which were leagued together; whence its present name Tripoli), and was probably raised to the rank of a separate province by Septimius Severus, who was a native of Leptis. Later it passed into possession of the Vandals and Greeks. In the seventh century it was conquered by the Arabs (see BARBARY STATES), and the feeble Christianity of the natives was supplanted by a vigorous and fanatical Mohammedanism. In 1510 the city of Tripoli was captured by Ferdinand the Catholic, from 1530 to 1551 it was in possession of the Knights of Saint John. Since 1551 the country has formed part of the Turkish Empire, though the authority of the Sultan, down to 1835, had been virtually at zero for more than a century. During this period Tripoli was a piratical stronghold. In consequence it was attacked by successive expeditions of the English and the French. In 1801-5 it was involved in an unsuccessful war with the United States, and in 1815 an American expedition exacted reparation for injuries done to American commerce. (See BARBARY POWERS, WARS WITH THE.) In 1835 an expedition was dispatched from Constantinople; the ruling bey, Karamanli (in whose family the sovereignty had continued uninterrupted since 1714), was overthrown and imprisoned; a new Turkish pasha, with viceregal powers, was appointed, and the State made a vilayet of the Ottoman Empire. Several rebellions have since taken place (notably in 1842 and 1844); but they have always been suppressed.

BIBLIOGRAPHY. Fournel, *La Tripolitaine* (Paris, 1887); Borsari, *Geografia della Tripolitania* (Naples, 1888); Thompson, *Life in Tripoli* (Liverpool, 1894); Cowper, *The Hill of the Graces* (London, 1897); Jago, "Report on Agriculture and Other Natural Resources of the

Vilayet of Tripoli," in *Great Britain Diplomatic and Consular Reports, Series 527* (ib., 1900); Minutelli, *La Tripolitania* (Turin, 1902).

TRIPOLI. The capital of the Turkish Vilayet of Tripoli, in Africa, on a promontory in the Mediterranean Sea, which forms a small bay, in latitude 32° 53′ N., longitude 13° 11′ E. Sahara approaches within a short distance. The town, whose high walls are dilapidated, lies in a fertile plain. It is typically Oriental, with its slender minarets and domed mosques. The castle of the beys is handsome. There is a splendid Roman triumphal arch, erected to Marcus Aurelius. Tripoli owes its importance as the commercial centre of the country to the three historic caravan routes of which it is the terminus. The first of these runs south across the desert of Sahara to Lake Chad; the second, southwest to Timbuktu; and the third, south by east to Wadai and points in Darfur. The city manufactures carpets, scarfs, and Spanish leather. The harbor is inaccessible to vessels drawing fourteen feet. It was visited in 1899 by 600 vessels. The trade is mostly in the hands of the Jews, who are congregated in a quarter of the town called Harra. Tripoli, one of the oldest cities of Africa, is the Œa of the Phœnicians. In February, 1804, the harbor was the scene of Lieutenant Decatur's brave exploit of recapturing and burning the American frigate *Philadelphia.* Population, in 1900, 30,000.

TRIPOLI, TRIPOLIS (the classical name), or **TARABULUS.** A town in Syria, Asiatic Turkey, the capital of a liwa in the Vilayet of Beirut, two and a half miles from El-Mina, its port, and 40 miles north-northeast of Beirut (Map: Turkey in Asia, F 5). The streets are well paved and covered in some places by arcades. The houses are built of a porous conglomerate, giving the town a picturesque Oriental aspect. There are fourteen churches, nearly equally divided between the Latin, Greek, and Maronite sects, an American mission station and girls' school, an orphanage and girls' home of the French Sisters of Charity, a synagogue, fourteen mosques, a monastery of dancing dervishes, a castle, and several large khâns. Tripoli is famous for its silk sashes. Silk, sugar-cane, ivory, ostrich feathers, wool, and sponges are exported. Mulberry trees are extensively cultivated for the silkworms. There is a large overland trade by camels with Aleppo. Population, 30,000, including El-Mina. Of the inhabitants, 24,000 are Moslems, 4500 Orthodox Greeks, 1500 Maronites. Tripoli was a member of the Phœnician league. At that time it lay on the coast. In 450 and in 550 it was destroyed by earthquakes. The Saracens took it in 638. It was several times captured by the Greeks. The Romans erected many fine buildings. After a siege of several years it was taken in 1109 by the Crusaders, under whom it enjoyed great prosperity. Destroyed by the Egyptian Sultan, Kalaun, in 1289, it was rebuilt on its present site.

TRIPOLITE (from *Tripoli,* in Africa), or **TRIPOLI.** A name sometimes applied to diatomaceous earth (q.v.), but also used to designate the siliceous residues left by the decay of impure limestones and schists. The last-named material is extensively mined in Newton County, Mo., and is employed as an abrasive and in water filters.

TRIPOLITZA, trē'pô-lyĕ'tsȧ, or **TRIP'OLIS.** The capital of the Nomarchy of Arcadia, Greece, 34 miles southwest of Argos, on the Argos-Kalamata Railway (Map: Greece, D 4). It is on a plain, 2000 feet above sea-level, near the site of the ancient Tegea and Mantinea. Tapestries and leather goods are manufactured. Its population in 1896 was 10,465. Tripolitza is a modern city, and under the Turkish pashas was the capital of the Morea. It was captured and burned by the Greek patriot Kolokotronis (q.v.) October 17, 1821. In 1825 it was taken by Ibrahim Pasha.

TRIPOS (from Lat. *tripus,* from Gk. *τρίπους, tripous,* tripod). A term peculiar to Cambridge University, denoting the three honor classes composed of successful candidates in the final examinations in the various departments. In mathematics the first honor men are known as senior and junior wranglers. The term is also used of the examination itself.

TRIPPANT. In heraldry (q.v.), a term used of a beast of chase represented as walking.

TRIP'PEL, Alexander (1744-93). A Swiss sculptor, born at Schaffhausen. He studied in Copenhagen under Wiedevelt and Stanley, went in 1771 to Paris, and in 1776 to Rome, where, besides antique and some biblical subjects, distinguished by noble treatment of form, he executed a Monument of Count Tchernitcheff for Moscow, the excellent busts of Goethe (1788) and Herder (1789), both in the grand-ducal library at Weimar, and the Gessner Monument at Zurich.

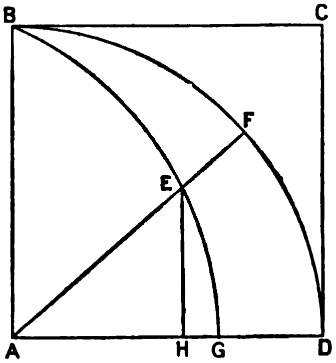
TRIPTOL'EMUS (Lat., from Gk. *Τριπτόλεμος*). In Greek legend, the bestower of grain upon mankind. In the Homeric Hymn to Demeter Triptolemus is merely one of the princes of Eleusis, to whom Demeter teaches her sacred rites, when she finally leaves her temple for Olympus. Later, however, he became the son of King Celeus and Meteneira, and a special favorite of Demeter, who gave him a winged chariot, or one drawn by winged dragons, and sent him forth to bear the knowledge of her gift of grain among mankind. This scene is frequently represented on Attic vases of the fifth century and later. Triptolemus had a temple at Eleusis, and was honored in Athens also in connection with the two goddesses Demeter and Kore. Attic belief also made him one of the judges in the lower world, apparently in place of Minos, who held an unfavorable place in local legends. The Greek type of Triptolemus was used by the Romans for *Bonus Eventus,* who seems to have had much resemblance to the Eleusinian hero.

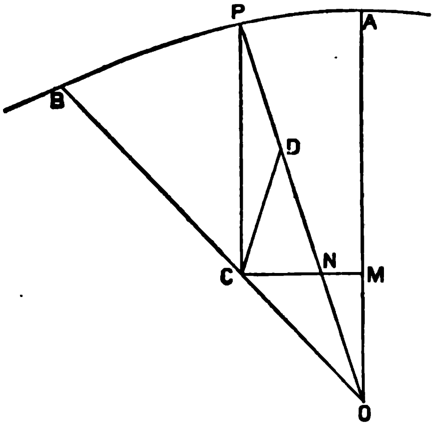
TRIP TO SCARBOROUGH, A. A comedy by Sheridan (1777), altered from Vanbrugh's *Relapse* (q.v.).

TRIPTYCH (from Gk. *τρίπτυχος, triptychos,* folded thrice, from *τρεῖς, treis,* three + *πτυχή, ptychē,* fold, from *πτύσσειν, ptyssein,* to fold). A set of three leaves, each painted with a distinct subject, but joined together by hinges, and capable of being folded so as to present a new face when closed. In ecclesiastical use, the triptych was usually a devotional picture, and was a form much in use for altar-pieces during the Gothic and early Renaissance periods. The three panels were usually of heavy wood, with an architectural framework, often in the form of a pointed arch, surrounding the painted or carved composition. Giotto, Orcagna, Gaddi, Fra Angelico, and many other famous artists painted triptychs. The German and Flemish wood-carvers and the Tuscan stuccoists of the Renaissance often retained the form, which vanished completely, however, in the sixteenth century.

TRIREME (Lat. *triremis*, galley with three banks of oars, from *tres*, three + *remus*, oar). In ancient times, a galley with three banks of oars; the common form of the ancient ship of war in the fifth and fourth centuries B.C. The credit of the invention was given to the Corinthians, who were said to have used triremes in their war with Corcyra in the seventh century B.C. The details of the structure of the Athenian trireme are still uncertain, as the statements of the ancient writers leave many points obscure, and the testimony of works of art is likewise full of uncertainties. It seems clear that the banks of oars were arranged one above the other, though not perpendicularly, that there was only one man to an oar, and that all the oars could be, and in battle were, used at the same time. For ordinary purposes the crew was, of course, divided into watches. The ancient trireme was of light draught, and could be easily hauled on shore, so that a high freeboard seems improbable, for reasons of stability; while the difficulty of keeping an effective stroke with oars of widely different lengths also speaks against any such mode of construction. The trireme was provided with a mainmast which carried a large square sail, that was lowered with its yard, or if possible left on shore, before going into action. In the latter case the mast also was unstepped and laid along the deck. There was also a small foremast, which seems to have projected somewhat like a bowsprit and likewise carried a square sail. The Attic trireme of the fourth century carried 170 oars, but probably not over 150 were actually used, the rest being a reserve equipment. Officers, sailors, and ten or twelve hoplites brought the total crew up to about 200 men. The ship was steered by large paddles on either side of the stern, connected inboard so that they could be handled by a single man. The time was given to the rowers by a special officer, the *keleustes*. The lowest rank of rowers were called *thalamitæ*, the second *zeugitæ*, and the uppermost *thranitæ*, and these received the highest pay, as handling the longest oars. In the early battles, such as Salamis, the chief endeavor was to lay the ships aboard and fight from the decks, trusting little to manœuvring, in which the Greeks seem to have felt themselves inferior. Later the Athenians developed a high degree of skill in handling their long, light vessels, and preferred to regard the trireme as the weapon, and to aim at disabling or sinking the enemy by the use of the ram, which projected at the water line or below. The attack was aimed at the quarter or side of the hostile ship, and to meet bows on was held unskillful and even dangerous, as the bow was not strongly built. Against the Carthaginians the Romans used boarding bridges in order to neutralize the seamanship of their opponents, and bring about a conflict of soldiers. Consult: Graser, *De Veterum Re Navali* (Berlin, 1864), and in *Philologus*, Sppl. Bd. iii.; Serre, *Les marines de guerre de l'antiquité et du moyen-âge* (Paris, 1885, 1891); Breusing, *Die Nautik der Alten* (Bremen, 1886), and *Die Lösung des Trierenrätsels* (Bremen, 1889); Assmann, s. v. "Seewesen," in Baumeister's *Denkmäler des klassischen Altertums* (Munich, 1889); Luebeck, *Das Seewesen der Griechen und Römer* (Hamburg, 1890, 1891); C. Torr, *Ancient Ships* (Cambridge, 1894).

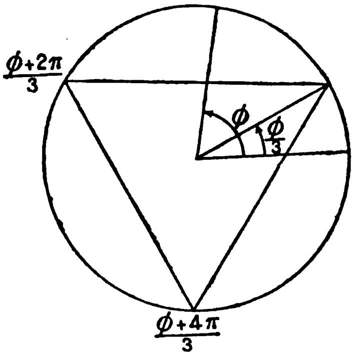
TRISECTION OF AN ANGLE (from *trisect*, from Lat. *tres*, three + *sectus*, p. p. of *secare*, to cut). One of the three famous problems of antiquity, the others being the duplication of the cube (q.v.) and the squaring of the circle. (See CIRCLE; QUADRATURE.) This problem, like the quadrature of the circle, is almost as old as geometry itself, but first received thorough investigation at the hands of the Sophists (B.C. 400). Hippias of this school invented the quadratrix (see QUADRATURE), by which any angle may be trisected. In the figure BD is a quadrant of a circle, BG is an arc of the quadratrix, and the construction involves the relation $\frac{DB}{FD}=\frac{BA}{EH}$. Hence by dividing BA into segments having any given ratio, the quadrant or any arc BD can be divided into arcs having the same ratio. If the arc is to be trisected the line corresponding to BA is trisected. The trisection of an angle is also accomplished by means of the conchoid (q.v.) of Nicomedes (B.C. 180). If AOB in the figure is





the angle to be trisected, C any point on OB, CM $\perp$ OA and CP $\parallel$ OA, it is easily seen that if P can be found so that PN=2CO then PO is a trisection line of angle AOB. But the trammel of the conchoid with its directrix resting on CM, parameter AM=CB=2CO, its pole at O, will describe a curve cutting CP in the required point. Many other methods have been devised for the solution of this problem. Viète (1591) showed its relation to the solution of the cubic equation. Gauss (1801) showed its relation to cyclotomic equations. Other mathematicians of the nineteenth century have declared its solution impossible by means of the straight edge and compasses (that is, by the postulates of Euclidean geometry). But the real reason for the failure of this method to solve the problem and also its associates was set forth by Klein.

The argument may be briefly stated as follows: (1) According to the formula of De Moivre (q.v.) the roots of the equation $x^3=\cos\phi+i\sin\phi$ are $x_1=\text{cis}\frac{\phi}{3}, x_2=\text{cis}\frac{\phi+2\pi}{3}, x_3=\text{cis}\frac{\phi+4\pi}{3}$. (2) These roots are represented geometrically by the vertices of an equilateral triangle inscribed in the unit circle with its centre at the origin. The figure shows that to the root x_1 corresponds the argument $\frac{\phi}{3}$. Hence the equation $x^3=\cos\phi+i\sin\phi$ is the analytic expression of the problem of the trisection of the angle. No root of the equation can be expressed as a rational function of $\cos\phi$ and $\sin\phi$. That is, the equation is irreducible and can be solved by the aid of a finite number of square roots only for special values of ϕ. Hence the trisection of an arbitrary angle cannot be effected with straight edge and compasses. Consult: Klein, *Famous Problems of Elementary Geometry* (1896, Eng. ed., Boston, 1897).



TRIS'MEGIS'TUS. See HERMETIC.

TRIS'MUS NASCEN'TIUM (Neo-Lat., lockjaw of the new born). A form of lockjaw occurring in newly born children a few days after birth. In consequence of it the children cannot nurse or cry, and they usually die in forty-eight hours. In some cases the attack comes in eight or ten days after birth. The cause is infection with the tetanus poison, probably always through the wound in the umbilical cord. See TETANUS.

TRISSINO, três-sĕ'nô, GIOVANNI GIORGIO (1478-1550). An Italian author, born at Vicenza. Excluded from his native territory by the Signoria of Venice, he spent some time in Germany, at Ferrara, and at Florence, and in 1514 went to Rome, where he was received with favor by Pope Leo X., who sent him on missions to the Emperor Maximilian and to the Signoria of Venice. At the instance of Leo X., the ban of proscription was taken off. He enjoyed the esteem of Popes Clement VII. and Paul III., and passed some time at Venice as nuncio of the former pontiff. He died in Rome December 8, 1550. Trissino sought to revive the epic in his mother tongue; he gave to the Italian stage its first regular tragedy, and he made the first large use of the hendecasyllable in blank verse. His attempt to produce an epic poem resulted in the *Italia liberata dai Goti*, a work of twenty-seven cantos in eleven-syllabled blank verse, completed in 1548. Blank verse and the hendecasyllable are used also in Trissino's *Sofonisba* (1515), which, although it has not the conventional division into acts, is regarded as the first regular tragedy in the modern languages of Europe. In a comedy, *I Simillimi*, which is a free imitation of the *Menæchmi* of Plautus, Trissino adopted his favorite eleven-syllabled blank verse and introduced certain lyrical strophes like those employed in the Greek comedy. Some Latin poems, a *Canzone a Clemente VII.*, and various *Rime* make up the rest of his compositions in verse. Trissino gave new life to the already mooted question of the proper Italian tongue with his edition of the *De Vulgari Eloquio* of Dante in 1529; and his treatise, *Il Castellano*, advocated the doctrine of a general Italian tongue as opposed to a merely Tuscan standard. Of his remaining works there may be mentioned the *Poetica*. Consult: Morsolin, *Giangiorgio Trissino, monografia di un letterato del secolo XVI.* (2d ed., Florence, 1894); Ciampolini, *La prima tragedia regolare nella letteratura italiana* (Lucca, 1884).

TRISSOTIN, trē'sō'tăN'. A poet in Molière's *Femmes savantes*, satirizing a gallant preacher, Abbé Cotin.

TRIST, NICHOLAS PHILIP (1800-74). An American lawyer and diplomatic agent, born at Charlottesville, Va. He was educated at the United States Military Academy, but did not graduate. He studied law under the direction of Thomas Jefferson, whose granddaughter he married, and of whose household he was a member, but became a clerk in the United States Treasury Department in 1824, and was private secretary to President Jackson in 1829. In 1834-36 he was United States Consul at Havana, and in 1845 he was chief clerk in the Department of State. During the Mexican War, after the American successes at Buena Vista and Vera Cruz, President Polk, on April 15, 1847, appointed Trist a special agent to negotiate for peace, but without notifying General Scott. On the arrival of Trist a violent quarrel ensued between him and Scott. Negotiations, however, were fruitless until after the capture of the City of Mexico and the resignation of Santa Anna as President. The succeeding Government wished to make terms and Trist, though his powers had been withdrawn, feeling that the strong desire for peace in the United States would excuse the irregularity, proceeded with the negotiations, by the advice of General Scott, who had now become his friend. The Treaty of Guadalupe Hidalgo was signed February 2, 1848, and was ratified by the United States Senate.

TRIS′TAN. See Tristram.

TRISTAN DA CUNHA, trĭs-tän′ dȧ kōōn′yȧ. A group of three small volcanic islands in the South Atlantic Ocean, situated in 37° 6′ south latitude, 12° 1′ west longitude, 1500 miles south-southwest of Saint Helena, and nearly midway between Cape Town and Buenos Ayres (Map: World, Eastern Hemisphere, N 19). Total area, 44 square miles. The largest and only inhabited island consists of an extinct volcano 8500 feet high. The climate is equable and healthful. The inhabitants numbered over 100 in 1880, but only 64 in 1897. They are chiefly the descendants of the British soldiers stationed there during Napoleon's captivity at Saint Helena, and of settlers from whaling ships. They are supported by agriculture and have a considerable number of cattle. The islands were discovered in 1506 by the Portuguese navigator Tristan da Cunha, and were taken by Great Britain in 1816.

TRIS′TIA (Lat., laments). Five books of short poems, in the elegiac metre, written by Ovid between 9 and 12 A.D. during his banishment at Tomi. The poems are letters to friends at home, recalling his former life, describing his present surroundings, and appealing for a mitigation of his harsh lot.

TRIS′TRAM, TRISTREM, or **TRISTAN.** The hero of a Welsh or Armorican romance originally distinct from the Arthurian cycle, but early incorporated with it. Tristram was the son of Roland of Ermonie by Blanchefleur, sister to King Mark of Cornwall. His father slain, his mother dead of grief (which she expressed in the child's very name), Tristram was reared by a faithful steward. At the age of fifteen he drifted to the Court of his uncle, King Mark, whose favor he won by his skill in the chase and in minstrelsy. He slew in mortal combat Moraunt, brother of the Queen of Ireland, who had come to demand tribute from King Mark. After suffering for three years from severe wounds, he sailed to Ireland, where they were healed by Iseult (variously spelled), daughter of the Queen. On his return to Cornwall, Tristram told his uncle of the marvelous beauty of the Irish princess, and was sent back to Ireland to ask her hand in marriage for the King. On the voyage from Ireland to Cornwall, Tristram and Iseult drank of a love-potion intended for King Mark and ever after loved each other. Iseult married Mark, but contrived, with the aid of her clever maid, to have many secret interviews with Tristram. At length the lovers were discovered, and Tristram fled to Wales, and later to Brittany, where he married another Iseult, the White-handed, daughter to Duke Florentine; but he never forgot Iseult of Ireland. Desperately wounded, he sent a messenger to Cornwall to summon her to heal him once more. He directed the messenger to hoist a white sail on the return voyage if the princess were on board; if not, a black sail. The Queen of Cornwall hastened to save her lover. As the vessel neared the shores of Brittany, Iseult of the White Hand saw the white sail; but, fired with jealous hate for her rival, she told her husband that the sail was black. Tristram sank back and died. Iseult of Ireland fell prostrate over the body of Tristram and died of a broken heart. King Mark subsequently learned the story of the love-potion, and buried the lovers in one grave, planting over Iseult a rose and over Tristram a vine, growing so intertwined that no one could separate them.

This passionate story, having some basis in Celtic myth, got into literature in the twelfth century and spread through Western Europe. It may be traced back to a poem, now existing only in fragments, by an Anglo-Norman trouvère named Béroul (about 1150). A little later than this (about 1160), the theme was treated by Chrestien de Troyes (q.v.) in a poem now lost. So far as has been determined, the source of the many later Tristrams is a very prolix poem by an Anglo-Norman named Thomas (about 1170). Before the close of the twelfth century Tristram and Iseult were among the favorite themes of the troubadours. From the French the romance passed into the German *Tristrant* (about 1175) by Eilhard of Oberge and the *Tristant und Isolde* (between 1200 and 1225) by Gottfried of Strassburg. Gottfried's poem, extending to 19,573 lines, is the most beautiful of all early versions. Left incomplete, it was continued by Ulric of Türheim and by Henry of Freiburg. The great popularity of the romance in Germany is further attested by numerous chapbooks. To the year 1226 belongs a Scandinavian version, *Tristram Saga ok Isondar*, and this in turn was put into Icelandic prose. The earliest extant English version is known as *Sir Tristrem.* The only extant manuscript belongs to the middle of the fifteenth century. It was composed in the last part of the thirteenth century, and has been ascribed to Thomas the Rhymer (q.v.). In 1469 was published at Rouen an immense prose *Tristram* in French, which was translated into German, Spanish, and Italian. It was also used by Sir Thomas Malory (q.v.) for his *Morte d'Arthur* (1485). In the nineteenth century Tristram and Iseult became a favorite theme in England and Germany. Following Malory, Tennyson wove the story into the *Idylls of the King* ("The Last Tournament"). In his noble *Tristram and Iseult,* Matthew Arnold awakened pity for Iseult of Brittany. But Swinburne in his *Tristram of Lyonesse* best expressed the tremendous passion of the mediæval tale. The theme was also treated by Karl Immermann (1841), and splendidly by Wagner in his operatic poem *Tristan und Isolde* (1859). Consult the English *Sir Tristrem* as edited by G. P. McNeill for the "Scottish Text Society" (Edinburgh, 1886), and by E. Kölbing in *Die nordische und die englische Version der Tristansage* (Heilbronn, 1878-82); also Golther, *Die Sage von Tristan und Isolde* (Münich, 1887). A charming version of the Tristram story is that of J. Bédier, *Le roman de Tristan et Iseut* (5th ed., Paris, 1902).

TRISTRAM, Henry Baker (1822—). An English clergyman, traveler, and author, born at Eglingham, Northumberland. He graduated at Lincoln College, Oxford, in 1844, and in 1880 became rural dean of Durham. He traveled extensively in biblical lands and elsewhere, and published, among other works: *The Great Sahara* (1860); *Land of Israel* (1865; 2d ed. 1882); *Natural History of the Bible* (1867; 5th ed. 1880); *Bible Places, or Topography of the Holy Land* (1872-97); *Land of Moab* (1873; 2d ed.

1874); *Pathways of Palestine* (2 vols., 1882); *Fauna and Flora of Palestine* (1884); and *Eastern Customs in Bible Lands* (1894).

TRISTRAM SHANDY, The Life and Opinions of. A novel by Laurence Sterne in 9 volumes (1759-67). The plot is slight and without continuity. The chief interest of the work is in its painting of individual characters: Walter Shandy, the father of the nominal hero, a man of varied and useless learning; Captain Shandy (Uncle Toby), the real hero of the story; Corporal Trim, and Yorick, whose figures stand out from a background of satire, drollery, and philosophical disquisitions.

TRITHE'MIUS, Johannes (1462-1516). A German Catholic theologian and historian. His real name was Heidenberg, but he was called Tritheim or Trithemius from his birthplace, Trittenheim. In 1482 he entered the Benedictine monastery at Sponheim, near Kreuznach, and in 1483 became its abbot. Here he collected a library which made the house famous. His rule was strict, and his monks resented his long absence in the neighboring country, so in 1506 he exchanged Sponheim for the Scotch monastery of Saint James at Würzburg, and there he died. His writings are very numerous; the principal ones are his sermons to monks (1576), but of greater value are his familiar letters (published 1536). He was also a pioneer author in German Church history, and invented a popular system of shorthand, *Steganographia* (Frankfort, 1606, n. e. 1635), for which see Bailey, *John Dee and the Steganographia of Trithemius* (London, 1879). Consult his *Life* by L. Silbernagel (2d ed., Landshut, 1868); Schneefarn, *Abt Johannes Trithemius und Kloster Sponheim* (Kreuznach, 1882).

TRI'TON (Lat., from Gk. Τρίτων). In Greek mythology, a son of Poseidon and Amphitrite, who dwells with his parents in a golden palace at the bottom of the sea. He seems especially connected with Bœotia, and was perhaps originally a local divinity of Alalcomenæ or Tanagra. In this region took place the conflict of Hercules with Triton, which was a favorite subject in early works of art. In the fourth century B.C. and later, we find a whole race of Tritons, to be compared with Panes, Sileni, and similar multiplications. In art they are at first human to the breast or waist, ending in the tail of a sea-serpent or fish. In later art we find the legs replaced by fishes' tails, or else the figure that of a sea-centaur, with the head and trunk of a man, the fore legs and body of a horse, and passing into a serpent with a fish's tail. Characteristic is Triton's conch-shell, on which he is represented as blowing stormily or gently. Pausanias (ix. 22) describes a Triton exhibited in Rome, which differed from the representations in art, and seems to have been the ingenious fabrication of some ancient showman.

TRITON CONVERTED INTO A WAR-TRUMPET.

TRITON. (1) A genus of aquatic amphibians, the newts (q.v.). (2) Any of several large gastropod shells, especially a large species (*Triton Tritonis*), having a spiral shell more than a foot long, which is used as a war-trumpet by natives of the South Sea Islands, the example illustrated being one from the Admiralty Islands.

TRITONE (from Gk. *τρίτονος*, *tritonos*, having three tones, from *τρεῖς*, *treis*, three + *τόνος*, *tonos*, tone, sound, tension, strength, cord). In music, a term denoting the augmented fourth which is a succession of three whole tones, as F—B. A progression by the interval of the tritone was strictly forbidden by the older theorists. Even in modern music it is used but sparingly.

TRITYL'ODON (Neo-Lat., from Gk. *τρεῖς*, *treis*, three + *τύλος*, *tylos*, knob, knot, callus + *ὀδούς*, *odous*, tooth). A small extinct reptile of the suborder Theriodontia, known by its skull, which has a remarkably mammalian expression and which is found in the Karoo beds of South Africa. See Theromorpha.

TRIUMPH (Lat. *triumphus*, OLat. *triumpus*, triumph, victory, shout of joy, Gk. *θρίαμβος*, *thriambos*, procession at the feast of Bacchus, name of Bacchus; of uncertain etymology). The name given in ancient Rome to the highest public honor bestowed on a general who had been successful in war. The victor, after having pronounced a eulogy on the bravery of his soldiers, ascended his triumphal car and passed through the Porta Triumphalis (which probably stood on the Campus Martius), where the senate met him, and the procession was organized and entered the city, passing by the *Via Sacra* to the Capitol. First marched the senate, headed by the magistrates; next came a body of trumpeters; then a train of carriages and frames laden with the spoils of the vanquished; then a body of flute-players, followed by the oxen to be sacrificed, and the sacrificing priests; then the distinguished captives with bands of inferior prisoners in chains; after whom walked the lictors of the imperator, having the fasces wreathed with laurel. Next came the hero of the day—the imperator—in a circular chariot. He was attired in an embroidered robe and flowered tunic, bearing in his right hand a laurel bough, in his left a sceptre, and having his brows garlanded with Delphic laurel. He was accompanied by his children and his intimate friends. His grown-up sons, the legates, tribunes, and equites, rode behind; and the rear was brought up by the rest of the soldiery, singing or jesting at their pleasure, for it was a day of carnival and license. When the procession had reached the foot of the Capitoline some of the captive chiefs were put to death; the procession, after waiting to hear their death announced, mounted to the Temple of Jupiter Capitolinus, where the oxen were sacrificed, and the laurel wreath placed in the lap of Jupiter. In the evening the imperator was publicly feasted, and it was customary to provide him a site for a house at the public expense. Under the Empire generals serving abroad were considered to be the Emperor's lieutenants, and therefore, however successful in their wars, they had no claim to a triumph. They received instead *triumphal decorations* and other rewards.

The *ovation*, or lesser triumph, differed from the greater chiefly in these respects: that the imperator entered the city on foot, clad in the simple *toga prætexta* of a magistrate, and wearing a wreath, not of laurel, but of myrtle; that he bore no sceptre, was not preceded by the senate and flourish of trumpets, nor followed by his victorious troops, but only by the equites and the populace, and that the ceremonies were concluded by the sacrifice of a sheep instead of a bull, whence, doubtless, the name *ovation* (from *ovis*, a sheep). Some variations of these ceremonies are found in various authorities and on various monuments.

TRIUMVIRATE (Lat. *triumviratus*, office of a triumvir, union of three men, from *triumvir*, one of a board of three men associated in a public office, from *trium*, gen. pl. of *tres*, three + *vir*, man). The name given in Roman history to the private league entered into between Pompey, Cæsar, and Crassus—the three most powerful men of their time. This compact was not a triumvirate, in the proper sense of the term; it had no legally constituted existence. The term is also applied to the division of government between Octavian (Augustus), Antonius, and Lepidus in the civil wars that followed the murder of Cæsar—an arrangement sanctioned, and therefore legalized, by the senate. The former is usually called the *first*, the latter the *second* triumvirate.

TRIVAN'DRUM. A military cantonment and the capital of the native State of Travancore (q.v.), Madras, India, 53 miles southwest of Tinnevelli and about 2 miles from the Arabian Sea (Map: India, C 7). Among the features are the fort with its Maharaja palaces, the temple to Vishnu, the observatory, and the Napier Museum. The Maharaja College here is one of the leading institutions for higher education in India. There is also a Sanskrit college. Wood-carving is the principal industry. Population, in 1901, including cantonment, 57,882.

TRIV'ET (or **TREVET**), Nicholas (c.1258-1328). An English historian, belonging probably to a Somerset family. He is said to have studied at Oxford and at Paris, and to have been a Dominican friar in London, becoming eventually the prior of his house. He wrote extensively on theology and Latin literature, but he is chiefly known for his *Annales sex Regum Angliæ qui a Comitibus Andegavensibus Originem Traxerunt* (ed. by T. Hog for the English Historical Society, 1845). This chronicle history of the Angevins is particularly valuable for the reign of Edward I., the period in which the author flourished. The entire period covered by the *Annales* is from 1136 to 1307.

TRIVIER, trē'vyȧ', Elisée Camille Ernest (1842—). A French explorer, born at Rochefort. He served in the expedition sent out by Napoleon III. to Mexico, and afterwards spent several years in Argentina. In 1888 he was sent out by the journal *La Gironde* of Bordeaux to search for the explorer Stanley. With a single white companion and two Sengalis he started from Loango on the west coast in December of 1888, and a little less than a year afterwards reached Zanzibar. Upon his return to France he published *Mon voyage au continent noir.*

TRIV'IUM (Lat., meeting of three roads). In the curriculum of the early universities, the lower section of the Seven Liberal Arts. It embraced grammar, logic, and rhetoric.

TROADES, trŏ'ȧ-dēz (Lat., from Gk. Τρῳάδες, the Trojan Women). A play by Euripides (B.C. 455), the scene of which is laid at Troy in the Grecian camp, where the captured would have been allotted to their conquerors. The play is made up of wonderful scenes of the fall of Troy, but lacks unity, and is marred by rhetorical display.

TROCADÉRO, trō'kȧ'dȧ'rō'. An elevation on the right bank of the Seine, opposite the Pont d'Iéna, named after a Spanish fort near Cadiz taken by the French in 1823. The ground was laid out in terraces for the Exhibition of 1867, and for that of 1878 the present Palais du Trocadéro was erected. The building, an immense structure in Oriental style, consists of a central portion flanked by curving wings each 220 yards in length. In the middle façade is a balcony with six allegorical bronze figures; below it a large cascade falls into a basin 196 feet in diameter. The building is surrounded by a small park with an aquarium, and contains a hall for concerts seating 6000, and important museums of comparative sculpture and ethnography.

TROCHEE, trŏ'kē (Lat. *trochæus*, from Gk. τροχαῖος, *trochaios*, trochee, tribrach, running, from τροχός, *trochos*, a running, from τρέχειν, *trechein*, to run). The name of a foot, or measure, in Greek and Latin verse, consisting of a long and a short syllable (— ⌣). This rapid measure was employed both in tragedy and in comedy. By analogy the term is used in modern verse to designate a dissyllabic measure consisting of a stressed and an unstressed syllable; for example:

When shall wé three meét again'?

See Versification.

TROCHILIDÆ, trō-kĭl'ĭ-dē. The family of the humming-birds (q.v.).

TROCHILUS, trŏ'kĭ-lŭs. (1) The typical genus of humming-birds (q.v.). (2) The ancient name of a certain plover. See Crocodile-Bird.

TROCHOID, trŏ'koid. See Cycloid.

TROCHOSPHERE, or Trochophore. A larval form common to many of the lower invertebrates, which consists of an oval or pear-like body of miscroscopic minuteness, with a broader and a narrower end, and a distinct bilateral symmetry. The body is encircled by a double zone of strong cilia. The mouth, just behind this circlet, leads into an alimentary which winds toward the small end, where an anal aperture opens. The broader end exhibits sense-organs varying in different species in number and character. From this kind of larva the adult forms of the higher groups (many worms, polyzoans, mollusks, etc.) are developed by some sort of true metamorphosis, resulting in an animal utterly different; but in certain very lowly groups, such as the wheel-animalcules (Rotifera) and certain closely allied microscopic aquatic forms, no metamorphosis occurs, and the adult may be looked upon as a somewhat modified trochosphere. These groups have therefore been associated by some zoölogists into a phylum termed Trochelminthes. Consult Parker and Haswell, *Text-book of Zoölogy* (New York, 1897).

TROCHU, trō'shụ', Louis Jules (1815-96). A French general, born at Palais, in the Department of Morbihan. After studying in the General Staff Academy, he fought, after 1846, with great distinction in Algeria, and in 1851 became head of a bureau in the Ministry of War. During the Crimean War he served as aid to Saint-Arnaud and Canrobert, was made a general of brigade, and at Sebastopol distinguished himself in the storming of the Malakoff bastion, September 8, 1855. As general of division during the Austro-Italian war of 1859 he did excellent service at Solferino, assuming, after the conclusion of peace, an important post in the War Department. In 1867 he published, anonymously, *L'armée française en 1867*, in which he criticised severely the defects in the French army organization, thereby losing favor at Court. After the outbreak of the war with Germany, he became, August, 1870, Governor of Paris, and on the downfall of the Second Empire, after Sedan, was made head of the Government of National Defense, remaining at the same time in command of the military forces of the city. His half-hearted defense of the capital subjected him to bitter criticism, and when further resistance to the besieging forces had become impossible, he laid down the office of Governor, January 22, 1871, a week before the capitulation of the city. He remained at the head of the Government till the meeting of the National Assembly, of which he was a member. In 1873 he resigned from the army and retired to private life. He died at Tours October 7, 1896. In defense of his conduct during the siege of Paris, he published *L'empire et la défense de Paris devant le jury de la Seine* (1872) ; *Pour la vérité et pour la justice* (1873) ; *La politique et le siège de Paris* (1874).

TROCTOLITE (from Gk. *τρωκτός*, *trōktos*, that which can be gnawed, from *τρώγειν*, *trōgein*, to gnaw + *λίθος*, *lithos*, stone). An olivine gabbro (q.v.), especially rich in serpentinized olivine, in Germany called *Forellenstein* (trout-stone).

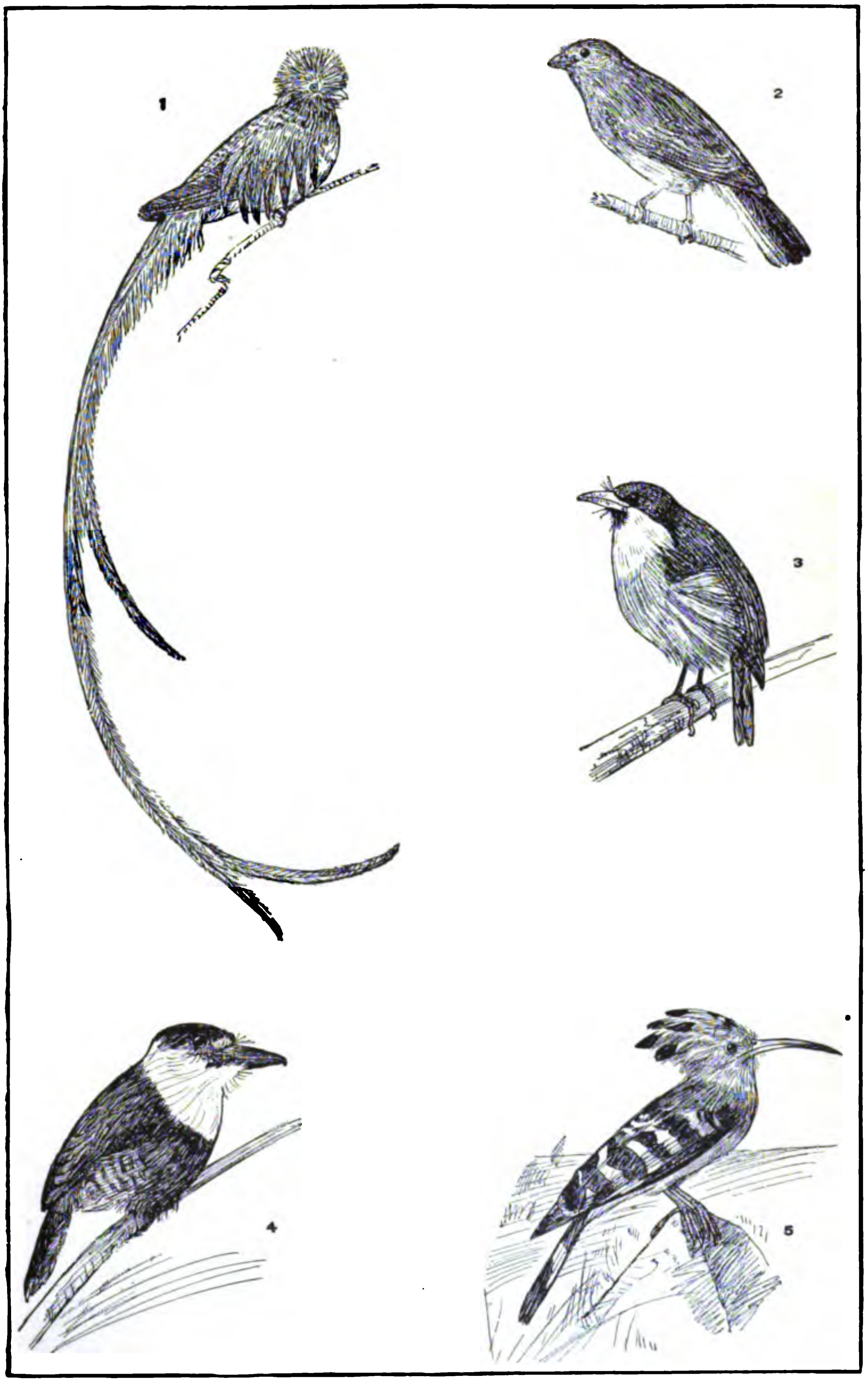
TRŒ'ZEN (Lat., from Gk. *Τροιζήν*, *Troizēn*). An ancient city of Greece in Argolis, about 2 miles from the Saronic Gulf, nearly opposite Calauria. It played some part in Greek legend, being closely associated with Attica, as the birthplace of Theseus, whose mother, Æthra, was daughter of King Pittheus. Here also was localized the story of the fatal love of Phædra (q.v.) for her stepson Hippolytus (q.v.). In historic times it was a Dorian city. During the invasion of Xerxes it took a prominent part in the defense of Greece, sending ships to the Greek fleet, and receiving with great kindness the Athenian women and children when driven from their city by the Persian advance. It was later a faithful ally of Sparta during the Peloponnesian and Corinthian wars. Under the Macedonian supremacy it changed masters frequently, now being in the hands of Macedon, again under Sparta, and again brought by Aratus into the Achæan League. In Roman times it seems to have continued to flourish, for Pausanias (q.v.) gives a somewhat detailed account of the objects of interest in the place. The site near the modern village of Damala is marked by few ruins, and excavations undertaken by the French School at Athens have brought to light little beyond the foundations of some large buildings of rather uncertain use.

TROGLODYTES, trŏg'lō-dī'tēz (Lat. *troglodyta*, from Gk. *τρωγλοδύτης*, *trōglodytēs*, cave-dweller, one who creeps into holes, from *τρώγλη*, *trōglē*, cave, hole + *δύειν*, *dyein*, to enter, creep into). The name given by the Greeks to tribes or races of uncivilized men, who dwelt either in natural caverns, or in holes which they had dug for themselves in the earth. They are mentioned by Strabo as existing as far west as Mauretania, and as far east as the Caucasus. Perhaps the best-known troglodytes of ancient times were those of Southern Egypt and Ethiopia, where a considerable extent of country was called *Regio Troglodytica*. According to the Greek accounts they could not speak articulately, but shrieked or screamed like the lower animals. Their chief occupation was herding cattle, and their habits of life were rude and debased. They are reported to have eaten not only the flesh, but the bones and hides of their cattle; their drink is said to have been a mixture of milk and blood; and they had a community of wives. They went almost naked, and put to death the aged and infirm. The name is occasionally applied loosely to any class of cave-dwellers (q.v.).

TROGON (Neo-Lat., from Gk. *τρώγων*, pres. part. of *τρώγειν*, *trōgein*, to gnaw). A bird of the family Trogonidæ, including about 50 species remarkable for the beauty of their plumage, which is soft, full, and brightly colored. The bill is short, strong, with a wide gape; the tail generally long, in some species very long; the feet small, and frequently feathered almost to the toes. The toes are two in front and two behind, but, unlike all other zygodactylous birds, the reversed toes are the first and second instead of the first and fourth. All the trogons are tropical. They abound most of all in South America, but a number occur in Asia and a few in Africa. One species, the copper-tailed trogon (*Trogon ambiguus*), is found as far north as the valley of the Rio Grande. It is 11 inches long, bright metallic golden green, throat white, breast and belly carmine, middle tail feathers coppery green, the rest of the tail white and black. The most gorgeous of the trogons is the quetzal (q.v.). Trogons are usually seen singly or in small flocks, and are unsuspicious. They remain most of the time in the thick forest, resting quietly during the heat of the day. The Old World species feed principally on insects, but American trogons eat much fruit, and also catch insects, crabs, crayfish, small lizards, snails, and the like, getting most of this food on the wing or by clinging to the branches of trees, like woodpeckers or mouse-birds. Their notes are loud, rather discordant cries, varied by clucking, whistling, and other strange notes. No nest is made, the round whitish eggs being laid in a hole excavated in a rotting tree-stub. The group is ancient, as is known by fossil examples, and sufficiently distinct to be ranked as a suborder. Extended accounts of the American trogons are given by Sclater and Salvin in *Biologia Centrali-Americana*, vol. iii. (London, 1896). See Plate of TROGON, HOOPOE, ETC.

TRO'GUS POMPE'IUS. A Roman historian of Gallic origin who lived during the reign of Augustus, son of one of Cæsar's secretaries. He was the author of *Historiæ Philippicæ* (in 44 books), a universal history from the time of Ninus, King of Assyria, down to A.D. 5. The original work, which was drawn from some of the best Greek historical writers, is lost, but an epit-

TROGON, HOOPOE, ETC.



1. GREEN TROGON or QUETZAL (Pharomacrus mocinno)
2. LESSER HONEY-GUIDE (Indicator minor).
3. YELLOW-THROATED BARBET (Capito Richardsoni).
4. CAYENNE PUFF-BIRD (Bucco Ordi).
5. MADAGASCAR HOOPOE (Upupa marginata).

ome of it by Justin is still extant. In addition to the historical narrative, the work is said to have contained interesting accounts relating to geography, ethnography, and natural science. Trogus is said to have written several zoölogical and botanical works, based largely on the works of Aristotle and Theophrastus. Consult: Heeren, *Commentationes de Trogi Pompeii ejusque Epitomatoris Justini Fontibus et Auctoritate*, printed in Frotscher's edition of Justinus (Leipzig, 1827-30); and Crohn, *De Trogi apud Antiquos Auctoritate* (Strassburg, 1882).

TRO′ILUS (Lat., from Gk. Τρωΐλος). A son of Priam, or of Apollo, who was slain by Achilles.

TROILUS AND CRES′SIDA. A drama by Shakespeare, probably originally written about 1602 and revised before 1609, when it was printed in two editions. The sources were probably Chaucer, Le Fèvre's *Recuyen of the Histories of Troye*, Lydgate's *Troy-Book*, and perhaps Chapman's *Homer*, partly translated in 1597.

TROIS MOUSQUETAIRES, trwä mụs'ke-tär′, LES (Fr., The Three Musketeers). A romance by Dumas (1844). The scene is laid in the time of Richelieu, in whose affairs the three famous guardsmen Athos, Porthos, and Aramis and their companion D'Artagnan take part.

TROITZK, trō'itsk. A town in the Government of Orenburg, Russia, on the Uya, 394 miles northeast of Orenburg (Map: Russia, K 4). It has a 'barter court,' where an extensive barter trade with the Kirghizes and other tribes is transacted. Population, in 1897, 23,100.

TROJAN WAR. A famous legendary war, generally placed about the beginning of the twelfth century B.C.; undertaken by the Greeks for the recovery of Helen, wife of King Menelaus of Sparta, who had been carried off by Paris, son of the Trojan King, Priam. At the marriage of Peleus and Thetis, Paris had adjudged the golden apple thrown by Eris, and inscribed "For the Fairest," to Aphrodite, thereby securing Helen by her favor and bringing down on the Trojans the lasting wrath of the slighted Hera and Athene. The expedition to avenge the injury to Menelaus was placed under the command of his brother, Agamemnon, King of Argos, and was joined by the Greek heroes, including Achilles, Patroclus, the two Ajaxes, Teucer, Nestor, Odysseus, Diomedes, and Idomeneus. They assembled at Aulis with 100,000 men and 1186 ships and proceeded to Troy, where their demand for the return of Helen was refused. The siege was then begun. It lasted ten years and terminated only by treachery, when the Greek warriors were introduced into the city in the interior of a great wooden horse. The sack and burning of Troy follow, with the escape of Æneas, whose progeny were to be the founders of Rome.

The story of the war is told in various classical epic poems, of which the *Iliad* is the most famous. It terminates with the death of Hector, the principal hero of the Trojans. The *Little Iliad*, ascribed to Lesches of Lesbos, was composed about B.C. 660. In four books it gave the story of the contest of Odysseus and Ajax, son of Telamon, for the armor of Achilles, the deaths of Ajax, Paris, and Eurypylus, the stealing of the Palladium, and the construction of the wooden horse. At this point the legend was taken up by the *Iliou Persis* or *Sack of Troy*, by Arctinus, in two books, ending with the escape of Polyxena at the tomb of Achilles. The *Nostoi* (Returns), attributed to Agias of Trœzen, in five books, told of the wanderings of Menelaus, Calchas, and Neoptolemus, and the murder of Agamemnon. The *Telegonia*, by Eugammon of Cyrene, related various adventures of Odysseus after the slaying of the suitors, his death at the hands of his son Telegonus, and the latter's marriage to Penelope.

The legendary history of Troy before the Trojan War, like other Greek myths, varied much in details. It was said that the place owed its name to Ilus, son of Tros, son of Dardanus. Its walls were built by Poseidon for Laomedon, who, however, cheated the god of his promised reward. Hercules rescued Hesione, the daughter of Laomedon, from the sea-monster to which she had been exposed, but was likewise cheated by the King, whereupon he and Telamon attacked and captured the city.

The Trojan legend was very popular in the Middle Ages, and formed, with the Charlemagne story and the Arthurian traditions, one of the three great divisions into which the work of the French romance-writers falls. Celtic legends tell of a certain Brutus who, driven from Troy, founded Brutannia or Britannia. Geoffrey of Monmouth calls him a great-grandson of Æneas. The spread of the legend is due mainly to Benoît de Sainte-More. The gist of the *Iliad* was used in the Latin of Dictys of Crete and by Dares the Phrygian. Benoît knew both Dictys and Dares, but preferred the drier account of the latter, in which the people of the West were reported to descend from the Trojans. This was used about 1200 by Herbart von Fritzlar, and about 1250 by Konrad von Würzburg; before 1288 Guido della Colonna had recast it in Latin prose. Benoît's version may also be traced in Boccaccio's *Filostrato* (1344). This is the main source of Chaucer's *Troylus and Cryseyde* (c. 1369), as that is of Shakespeare's play. Consult: Dunger, *Die Sage vom trojanischen Kriege in den Bearbeitungen des Mittelalters* (Dresden, 1869); Saintsbury, *The Flourishing of Romance and the Rise of Allegory* (London, 1897).

TROLLEY (from *troll*, from OF. *troller*, *trauler*, *troler*, Fr. *trôler*, to ramble, stroll, drag about, probably from MHG., Ger. *trollen*, to roll, run, and connected with Welsh *troell*, wheel, pulley, Bret. *trôel*, winding plant, *trô*, circle). A word first coined in England, and there used in the sense of a handcart and then of a truck. In the United States it means a sort of pulley in contact with an overhead wire and connected with a rod or flexible conductor, by which an electric current is transmitted to the motor of a street-car or electric locomotive. See ELECTRIC RAILWAYS.

TROLLING. A form of angling. Some trolling is from a boat, the rowing of which gives impulse to the line; others troll from the river or lake bank, winding in the bait with the reel, and still others troll in the surf, where the current of tides or undertow of the sea carries the bait. Whichever form is adopted, the lure is a spoon-bait, or live or artificial fish or frog. The bait spins in passing through the water, and a swivel at each end of the leader is always necessary to prevent the twisting of the line. The heaviest fish trolled for in fresh water is the maskinonge, the standard bait for which is a frog alive or imitation, but the surest is the spoon, preferably showing a golden hue, size No. 8, the feathers at the head of which should be bright scarlet, and a single hook. The bluefish is taken by trolling from a boat in motion, or from a stationary boat, into the waters around which have been thrown small pieces of menhaden. The Spanish mackerel is taken by trolling, and many other fish of the Atlantic and Pacific and of the Gulf. Off the Florida coast and in the Gulf the tarpon is taken by trolling from a slowly rowed boat. About 100 feet of line is trailed from the rod; the line has a piano-wire snell and a fish line at the outer end. On the California coast the tuna, the yellow-tail, and barracuda have been taken on hook. See ANGLING; FLY-CASTING; BAIT-FISHING.

TROLLIUS. See GLOBE-FLOWER.

TROLLOPE, trŏl′lŭp, ANTHONY (1815-82). An English novelist, born in London, April 24, 1815, son of Frances Trollope (q.v.). Educated at Winchester and at Harrow, he proved a dull scholar, and his poverty made his school days most unhappy. About 1835 he obtained an official position in the General Post-Office in London. While connected with that department he found time to amuse the public with a long series of novels of remarkable merit. The first work which attracted serious attention to him, *The Warden* (1855), was followed by a continuation entitled *Barchester Towers* (1857), which remains, perhaps, the most widely read of all his books. In rapid succession to these came *Dr. Thorne* (1858), *The Three Clerks* (1858), *The Bertrams* (1859), *Castle Richmond* (1860), *Framley Parsonage* (1861), *Orley Farm* (1862), *The Small House at Allington* (1864), *Can You Forgive Her?* (1864-65), *Phineas Finn* (1869), *The Eustace Diamonds* (1873), *Phineas Redux* (1874), *The Way We Live Now* (1875), *Is He Popenjoy?* (1878), and other novels. Trollope also published several pleasant volumes of travel, among them being *North America* (1862), *Australia and New Zealand* (1874), and *South Africa* (1878). In biography, he wrote a *Life* of Cæsar (1870), and one of Cicero (1880), besides sketches of Thackeray (1879) and Palmerston (1882). He died at Harting, Sussex, December 6, 1882.

Trollope is one of the most admirable of the English realists. He delineates the English society of his time with wonderful penetration, and with an equal command of humor and of pathos. Hawthorne wrote of his novels: "They precisely suit my taste—solid and substantial . . . and just as real as if some giant had hewn a great lump out of the earth and put it under a glass case with all the inhabitants going about their daily business and not suspecting that they were being made a show of." He particularly excels in depicting life in the cathedral towns; and his portraits of bishops, archdeacons, and the minor clergy are remarkable for their truth and humor. His Mrs. Proudie, who appears in *Barchester Towers* and again in *The Last Chronicle of Barset* (1867), is the finest shrew since Shakespeare's Katherine. Very attractive, too, are his young girls, as Lily Dale, Mary Thorne, and Grace Crawley. Trollope did not himself lay any especial claim to psychological insight; yet it would be hard to find in English fiction anything more true and delicate than his analysis of the conscience of Septimus Harding, in *The Warden;* or anything more poignant than his study of jealousy in *He Knew He Was Right.* His Lizzie Eustace, in *The Eustace Diamonds,* is a type of insincerity and selfishness worthy to be set beside Thackeray's Becky Sharp. His snobs, his rustics, and his husband-hunting young women are all drawn with surprising vividness. On the whole, Trollope's best work is contained in *The Chronicles of Barsetshire* (13 vols., New York, 1892); yet many of his less read novels, such as *The Way We Live Now, The American Senator,* and *The Claverings,* are very little inferior. Curious facts concerning his life and methods of composition may be found in his *Autobiography* (New York, 1883). For critical estimates of Trollope, the reader is referred to a paper by Henry James in *Partial Portraits* (London and New York, 1883); and to H. T. Peck's Introduction to vol. i. of the 'Royal' edition of Trollope's best known novels (Philadelphia, 1900). Consult also Cross, *Development of the English Novel* (New York, 1899).

TROLLOPE, EDWARD (1817-93). An English clergyman and antiquary, educated at Eton and Oxford, graduating B.A. from Saint Mary Hall in 1839. Ordained priest in the Anglican Church (1841), he held various preferments, becoming Bishop of Nottingham in 1877. As secretary and as president of the Associated Architectural Societies, he took an active and judicious part in the work of church restoration. Among his works are *Illustrations of Ancient Art, selected from Objects discovered at Pompeii and Herculaneum* (1854); *Life of Pope Adrian IV.* (1856); *Handbook of the Paintings and Engravings Exhibited at Nottingham, Illustrating the Caroline Civil War* (1864); and *Notices of Ancient and Mediæval Labyrinths* (1866).

TROLLOPE, MRS. FRANCES (1780-1863). An English novelist and miscellaneous writer, born at Stapleton, near Bristol, March 10, 1780. Her father, William Milton, was subsequently vicar of Heckfield in Hampshire. In 1809 she was married to Thomas Anthony Trollope, a barrister. In 1827 she went to America, and during a three years' residence in the United States gathered the materials of her first book, *Domestic Manners of the Americans* (1832). This work attracted great attention, and the severity of certain of its strictures was much resented in the United States. Indeed, in 1833 appeared a pamphlet entitled *American Criticisms.* After the death of her husband (1835) Mrs. Trollope had to turn to literature for a living. For twenty years book after book came from her pen. Of her novels perhaps the best were *The Vicar of Wrexhill* (1837), *The Widow Barnaby* (1838), and the sequels of the latter, *The Widow Married* (1840) and *The Barnabys in America* (1843). Mrs. Trollope's last years were passed in Florence with her eldest son, Thomas Adolphus Trollope (q.v.). She died at Florence October 6, 1863. *The Domestic Manners of the Americans* was edited by H. T. Peck (New York, 1896). Consult *Frances Trollope*, by her daughter-in-law, Frances Eleanor Trollope (London, 1895).

TROLLOPE, THOMAS ADOLPHUS (1810-92). An English author, born in London April 29, 1810. His mother was Frances Trollope (q.v.), and Anthony Trollope (q.v.) was a younger brother. He was educated at Winchester and at Oxford. In 1843 he settled at Florence, where his house on the Piazza Maria Antonia became the gathering place of English and American authors traveling in Italy. To his hospitable wife Landor addressed the lines, "To Theodosia." Like his mother and brother, Trollope wielded a ready pen. Not reckoning a prodigious number of articles contributed to newspapers and other periodicals, he published fully sixty volumes. And, it is said, he was always interesting. His most conspicuous works were connected with Italy. Among them are: *Impressions of a Wanderer in Italy* (1850); *The Girlhood of Catherine de' Medici* (1856); *A Decade of Italian Women* (1859); *Filippo Strozzi, a History of the Last Days of the Old Italian Liberty* (1860); *A Lenten Journey in Umbria and the Marches of Ancona* (1862); *A History of the Commonwealth of Florence to the Fall of the Republic in 1531* (1865); and *The Story of the Life of Pius IX.* (1877). Trollope also wrote many novels. His last years were passed in England. He died at Clifton November 11, 1892. His second wife, **FRANCES ELEANOR TROLLOPE**, wrote *Black Spirits and White* (1877); *That Unfortunate Marriage* (1888); and *Frances Trollope, Her Life and Literary Work* (2 vols., 1895). Consult Trollope's autobiography under the titles *What I Remember* (2 vols., 1887) and *Further Reminiscences* (1889).

TROLLS (Icel., Swed. *troll*, troll; connected with Ger. *Droll*, *Troll*, troll, Eng. *droll*). In mythology, misshapen dwarfs. They inhabited hills and mounds, had abnormal thieving propensities, stole children and substituted their own offspring for them. They were peculiarly sensitive to noise, which was their especial aversion, as it reminded them of the hammer of Thor, which he was accustomed to throw after them. They were called 'the hill-people.' Though strong, they were easily outwitted by men.

TROMBONE (It. *trombone*, augmentative of *tromba*, trumpet, probably from OHG. *trumba*, *trumpa*, Ger. *Trommel*, drum, perhaps corrupted from Lat. *triumphus*, triumph; ultimately connected with Eng. *drum*). A musical instrument of the trumpet family, the tones of which are produced by means of a slide-mechanism. In its present form it was known as early as the beginning of the sixteenth century. To-day the trombone is made in four different sizes, known as the alto, tenor, bass, and contra-bass trombone. The compass of the alto trombone is from A to $e\flat^2$; that of the tenor trombone from E to $b\flat^1$; that of the bass trombone from $_1B$ to f^1; and that of the contra-bass trombone from $_1E$ to d^1. Besides this regular compass each trombone is capable of producing seven *pedal-tones*, descending chromatically and beginning a tritone (q.v.) below the lowest tone of the compass of the instrument. The intermediate tones between the highest pedal-tone and the lowest regular tone are wanting. The trombones are non-transposing instruments and the notes all sound as written. In playing this instrument seven positions are used. The first position is when the slide is completely pushed in. Taking the tenor trombone for the purpose of illustration, the lowest tone that can be produced in the first position is B♭. In every position all the partial tones from 2 to 8 (see ACOUSTICS), can be produced. Thus in the first position on the tenor trombone the following tones are produced: B♭, f, b♭, d^1, f^1, $a\flat^1$, $b\flat^1$. The second position is obtained by drawing out the slide so far that A is produced. The partial tones for this position are A, e, a, $c\sharp^1$, e^1, g^1, f^1. The third position begins on A♭ and so on, descending by semitones till the seventh position beginning with E is reached.

Recently trombones have been constructed in which the sliding mechanism is replaced by piston or rotary valves. These instruments permit more rapid execution than the sliding trombones, but are much inferior to the latter in purity of intonation. See ORCHESTRA.

TROMP, trŏmp, **CORNELIS** (1629-91). A Dutch admiral, second son of Martin Tromp. He was born at Rotterdam. As a youth he led a squadron against the Barbary pirates. He became rear-admiral in 1653. With Opdam he commanded the Dutch forces in the disastrous battle of Lowestoft (June 13, 1665) and in the rout succeeded in saving a part of the fleet. In June, 1666, he was with De Ruyter in a desperate four days' battle in the Downs against an English fleet under Monk and Prince Rupert, the combat resulting in victory for neither side. In August his conduct in the battle of Dunkirk led De Ruyter to prefer charges against him, which caused his removal. When war broke out in 1672 between Holland and the allied English and French, Tromp was restored to his command and fought with consummate bravery on June 7 and 14, 1673, against the combined English and French fleets, under Prince Rupert and D'Estrées, driving the enemy into the Thames. On August 21st a third great battle was fought near the Zealand coast. After the conclusion of peace Charles II. made Tromp a baron (1675). Tromp subsequently fought in the employ of the Danes against the Swedes, and after De Ruyter's death was made commander-in-chief of the naval forces of the Dutch. He died May 29, 1691, and was buried at Delft by his father's side.

TROMP, MARTIN HARPERTZOON (incorrectly, VAN TROMP) (1597-1653). A celebrated Dutch admiral, born at Brielle. He went to sea at a very early age, was made prisoner in an engagement with an English frigate, in which his father was killed, and for more than two years was held in confinement on board an English vessel. For some time after this his history is obscure, but in 1624 he appears as captain of a frigate in the Dutch navy, and in 1637 was made vice-admiral. In 1639 he won a brilliant victory over a Spanish fleet off Gravelines in the Straits of Dover, destroying 49 of the enemy's ships with the loss of only one vessel. His greatest fame, however, was gained in the war against England which broke out in 1652. In May of that year he was worsted by Blake and was compelled to yield the command to De Ruyter, but, restored to his post in November, he inflicted a severe defeat on Blake off the Goodwin Sands and for a time was master of the Channel. In February, 1653, while convoying a large merchant fleet through the Channel, he made a gallant running fight against a superior English fleet under Blake, Penn, and Monk. In June he encountered the English in the Channel and was compelled to seek refuge in the Texel, after losing seventeen of his ships. In the first days of August he once more took to the sea, and in a battle against the English fleet, under Monk, off Ter Heyde, which raged from August 8th to August 10th (old style, July 29th-31st), he lost twenty-six of his ships and his life. He was buried at Delft, and a splendid monument marks the grave of the victor in thirty-three naval combats.

TROMPETER VON SÄKKINGEN, trôm-pā'tẽr fôn zĕk'ĭng-*e*n, Der (Ger., The Trumpeter of Säkkingen). An extraordinarily popular poem by Joseph Viktor von Scheffel (1853). The story is a legend connected with a seventeenth-century tombstone in the churchyard of Säkkingen which records the death of Werner Kirchhofer and Maria Ursula, daughter of the Baron of Säkkingen. Werner, a musician, loved the Baron's daughter, whom her father therefore sent to the Viennese Court. Werner followed, was made leader of the Court band, and finally, through the intervention of the Emperor, received the reward of his constancy. Scheffel adheres closely to the original legend, weaving about it experiences of his own life. The poem is one of the most perfect expressions in literature of German sentiment.

TRONDHJEM, trŏn'yĕm, **THRONDHJEM**, or **DRONTHEIM**. A city of Norway, situated at the mouth of the Nid River, on the south shore of the Trondhjemsfjord, 240 miles north of Christiania (Map: Norway, D 5). Although it is so far north, its climate is remarkably mild, and the fjord never freezes. On one of the surrounding picturesque hills stands the fortress of Christiansten. Another fort is on the small island of Munkholm in the fjord opposite the city, celebrated as the place of imprisonment of the Danish Minister Griffenfeld (q.v.). The town is regularly laid out with wide streets. Many of the houses are built of wood. The principal building is the large cathedral, probably the finest church in Scandinavia. It was founded in the eleventh century over the tomb of Saint Olaf, and consists of a Gothic nave and choir with a Romanesque transept. It has latterly been restored. By the present Constitution of the country the kings of Sweden and Norway must be crowned in the Cathedral of Trondhjem. Noteworthy also are the arsenal in the old Kongsgaard and the fisheries museum and the leading library. The industries are represented by sawmills, wood-pulp factories, fish-curing establishments, machine shops, and shipyards. The commerce is very considerble. It amounts to over $9,000,000 annually, while the shipping entries in 1900 amounted to 277,743 tons. The chief exports are copper ore from the Röros mines, also iron and pyrites, timber, wood-pulp, and fish. Population, in 1891, 29,162; in 1901, 38,156. Trondhjem was founded by Olaf Tryggvason, who built a palace there in 996. Its early name was Nidaros. During the Middle Ages it was an important city and a goal of pilgrimage.

TROOP. See Army Organization.

TROOPIAL (Fr. *troupial*, from *troupe*, troop). A book name for the American hangnests and blackbirds of the family Icteridæ.

TROOST, trōst, Gerard (1776-1850). A Dutch-American geologist and mineralogist. He studied at the universities of Leyden and Amsterdam. In 1809, while on his way to Java as a member of a naval expedition, he was captured by an English privateer and carried to Dunkirk. Soon after his return to Paris, where he had studied mineralogy under Haüy, he undertook a voyage to the East Indies by way of America. But on account of political changes in Java he decided to remain in the United States. He was one of the founders and the first president of the Academy of Natural Sciences at Philadelphia. He was professor of mineralogy and chemistry at the College of Pharmacy and at the Philadelphia Museum, and in 1828 became professor of chemistry, geology, and mineralogy at the University of Nashville. His published works include contributions to scientific journals and a *Geological Survey of the Environs of Philadelphia* (1826). In 1814 he established the first alum factory in the United States at Cape Sable, Md.

TROPÆ'OLUM (Neo-Lat., from Gk. *τροπαῖος*, *tropaios*, relating to turning or change, from *τροπή*, *tropē*, a turning, from *τρέπειν*, *trepein*, to turn), Nasturtium, Indian Cress, Yellow Larkspur. A genus of the order Geraniaceæ, containing about 35 South American species of beautiful twining or spreading annuals and perennials, producing orange-yellow and sometimes very dark purple or blue flowers in summer. Many are cultivated for ornamental purposes upon arbors, walls, and trellises. The pickled fruits are sometimes employed as a substitute for capers and the fleshy rootstock of several species as a human food. The best known spe-

Tropæolum Majus, GARDEN NASTURTIUM.

cies is *Tropæolum majus*, a climbing annual in northern climates, which has long been grown in the United States as an ornamental plant. Dwarf varieties of this species are commonly grown in beds and borders. *Tropæolum minus* resembles the foregoing species, but is of weaker growth and produces smaller flowers. *Tropæolum Lobbianum*, a native of Colombia, is a vigorous climbing species, of which several beautiful varieties are in cultivation. *Tropæolum peregrinum*, sometimes called canary-bird flower, is grown as an annual in outdoor culture and as a perennial in conservatories. *Tropæolum tuberosum*, which produces scarlet and yellow flowers in the late summer, yields edible tubers, which are used as food in Peru. In northern climates the tubers are taken up in the fall and kept in a dry place during the winter. The annual species are grown from seeds sown in the spring in ordinary garden soil. The perennial species are propagated by the tubers or by cuttings of the young shoots grown under glass or by seeds. The perennials prefer a richer soil than the annuals, and they require plenty of moisture.

TROPE. A figure of speech. See RHETORIC, FIGURES OF.

TROPHO′NIUS (Lat., from Gk. Τροφώνιος). An ancient god of the earth, worshiped at Lebadea, in Bœotia, where he had a famous oracle in a subterranean cavern. He who wished to consult the oracle prepared himself by fasting, sacrifices, and purifications in a building dedicated to Tyche (Fortune) and Agathodæmon (Good Luck). After the due rites a sheep was sacrificed to Agamedes, brother of Trophonius, water from two springs, Forgetfulness and Memory, was drunk, and the consultor descended by a ladder to a vault, in the side of which was an opening. Through this the feet were inserted, a honey-cake to appease the spirits was grasped in each hand, and then some hidden force swept the visitor into the inner recesses, where he saw visions or heard voices, and finally returned feet foremost through the same opening by which he had descended. He was then seated on the stone of Remembrance and questioned by the priests, who interpreted his visions. Legend also told how Agamedes and Trophonius were sons of Erginos and famous architects of the early time, who built the temple at Delphi, a treasury for King Hyrieus of Hyria in Bœotia, and other buildings. According to the story, they left a stone loose in the treasury, and thus were enabled to avail themselves of the King's riches at their pleasure. At length Agamedes was caught in a trap, whereupon Trophonius cut off his brother's head and escaped, but at Lebadea was swallowed up by the earth. Another version laid the scene with King Augeas in Elis, and represented Agamedes as the father of Trophonius and Cercyon. Trophonius cut off his father's head to escape detection, and, while Cercyon went to Athens, retired to Bœotia, where he built himself an underground chamber. The same story is told by Herodotus of King Rhampsinitus in Egypt, and is a widely diffused folk-tale.

TROPHY (OF. *trophee*, Fr. *trophée*, from Lat. *trophæum*, *tropæum*, from Gk. τρόπαιον, *tropaion*, monument of an enemy's defeat, neu. sg. of τροπαῖος, *tropaios*, relating to turning or change). A memorial of victory erected on the spot where the enemy had turned to flight. Among the Greeks (with the exception of the Macedonians, who erected no trophies) one or two shields and helmets of the routed enemy, placed upon the trunk of a tree, served as the sign and memorial of victory. After a sea-fight the trophy consisted of the beaks and stern ornaments of the captured vessels, set up on the nearest coast. It was considered wrong to destroy such a trophy, and equally wrong to repair it, when it had fallen down through time, for animosity ought not to be perpetual.

TROPIC (from Lat. *tropicus*, from Gk. τροπικός, *tropikos*, relating to a turn or change, or to the solstice, from τροπή, *tropē*, a turning). One of two parallels of latitude on the terrestrial globe, passing through the most northerly and southerly points on the earth's surface at which the sun can ever be directly overhead. The tropic north of the equator is called the tropic of *Cancer*, because the sun at the summer solstice (at which time it is vertically over the tropic) enters the constellation of Cancer; and the southern one is, for a similar reason, denominated the tropic of *Capricorn*. The distance of the tropics from the equator, corresponding to the obliquity of the ecliptic, is about 23½ degrees. They are not absolutely fixed at a uniform distance from the equator, but the limits of their variation are extremely narrow. See PERTURBATIONS.

TROPIC BIRD, or BOATSWAIN BIRD. A sea-bird of the family Phaëtonidæ, related to the gannets, having very long wings and the two central tail-quills very long and slender. Only three species are known, all tropical and often wandering hundreds of miles from land, where they hover about vessels. Their flight is extremely swift and graceful, and they capture the fish upon which they subsist by plunging in the water, often from a great height. They breed upon rocky cliffs, making no nests, and laying a single pale-brown, much spotted egg. They are nearly helpless on land, and are often caught at their breeding-places and robbed of the long tail-feathers, which are prized among savages as decorations. The yellow-billed tropic bird (*Phaëton flavirostris*) breeds in the Bermudas and West Indies, and is white, with black on the wings. The other species belong mainly to the Indian and South Pacific oceans. See Plate of FISHING BIRDS.

TROPISM (from *trope*, from Gk. τροπή, *tropē*, a turning). The act of turning toward or being oriented by the stimulus of light, gravity, wind, food, and so on. Thus heliotropism, the first to be used of the many terms ending in *tropism*, means turning to the light. At first the term was restricted to such plants as the sunflower, which turns after or follows the sun, owing to the stimulus of the sun's rays. It was then found that animals were heliotropic, and further studies on the acts of animals in response to different physical stimuli have resulted in a somewhat extensive nomenclature. Tropism may be positive or negative. Certain plants, as plasmodia, and animals, as the sea-cucumber, the starfish, and even the lady-beetle, which are positively geotropic, are forced when on vertical surfaces to crawl upward; this is negative geotropism. The investigation of tropism has most important bearings on comparative psychology and the explanation of instinctive acts.

ANEMOTROPISM. An orientation of the body with respect to the wind, seen in flies (*Bibio ophyra*, etc.), which poise in swarms in the air, heading directly toward the wind, all the swarms of a given locality oriented in the same direction like weather-cocks. On the other hand, the locusts move with the wind and head away from it; i.e. they are negatively anemotropic (Wheeler).

CHEMOTROPISM. The orientation of an organism by molecules emanating from a centre of diffusion. As the name indicates, it means response to orders or tastes emanating from food, decaying substances, and other matters. Thus the maggot of the flesh and other flies are positively chemotropic toward certain chemical substances formed in decaying meat and cheese. The female fly is led not so much by a special instinct to these substances as by the stimulus of the rankly smelling meat. As soon, says Loeb, as the fly is seated on the meat chemical stimuli seem to throw into activity the muscles concerned in egg-laying and the eggs are deposited on the meat. Negative chemotropism is forcibly illustrated by the use of the oil of pennyroyal, of tobacco smoke, or kerosene oil in driving away flies and mosquitoes. For the botanical aspect of this tropism, see CHEMOTROPISM.

GALVANOTROPISM. When certain shrimps, crayfish, and salamanders are subjected to the effect of a galvanic current such changes of tension take place in the muscles of the appendages that movement toward the anode becomes easier and toward the cathode more difficult. The result is, says Loeb, that if the current is continued long enough all the animals collect at the positive pole. It differs from heliotropism chiefly in that the curves of the current take the place of the rays of light.

GEOTROPISM. As the result of the action of gravity, plants and certain animals tend to descend into or toward the earth. The act of righting in a starfish or sea-urchin, or in a polyp (sea-anemone), is the result of geotropic irritability, i.e. of positive geotropism. The effects of geotropism are seen in any moth or butterfly which has just emerged from the pupa-case. It is restless till it finds a perpendicular surface on which to support itself with its abdomen hanging down until the wings are fully expanded. A fly orients its body head downward, a position assumed by many web-weaving spiders. Geotropism plays a part in the depth-migrations of pelagic animals. See also GEOTROPISM IN PLANTS.

HELIOTROPISM or PHOTOTROPISM. Originally applied to the property certain plants possess of turning to the light. It has been found that many animals also are oriented toward the light. Loeb claims that in the case of animals which possess nerves "the movements of orientation toward light are governed by exactly the same external conditions and depend in the same way upon the external form of the body, as in the case of plants which possess no nerves." Many young or larval pelagic animals undergo periodic depth-migrations. They begin to migrate vertically upward toward the surface of the ocean in the evening, descending in the morning, but since they never sink beyond a depth of about 1200 feet below, where light does not penetrate, this fact suggests that the light is the controlling power in their depth-migrations. Loeb finds that the free-swimming animals at the surface of the sea are all permanently or for a short period positively heliotropic. There is a negative as well as a positive heliotropism. If light strikes one side of a positively heliotropic animal, an increase takes place in the tension of those muscles which turn the head to the source of light, while in the negatively heliotropic animal under the influence of one-sided illumination a decrease takes place in the tension of the same muscles, with the result that the negatively heliotropic animal is forced to move away from the source of light. The flight of moths toward a light is a case of heliotropism. Being a rapid flyer, the moth gets into the flame before the heat can check it.

PARAHELIOTROPISM. This is defined by Darwin as the movement by which some leaves temporarily direct their edges to the source of light.

HYDROTROPISM. If a king-crab is placed on shore a few feet from the water's edge it will seek the water, perhaps oriented by the moisture not far away. Ants exhibit a reaction to heat (thermotropism) and also hydrotropism, in the care with which they move the eggs, young, and old larvæ and pupæ, as the nest becomes too warm or cold, moist or dry, at different times. For its influence on plants, see HYDROTROPISM.

RHEOTROPISM. This is illustrated by the action of fish in heading up stream and by the slime protozoan in creeping against the current.

STEREOTROPISM. This form of tropism is contact-irritability, which forces the animal to bring the ventral side of the body in contact with solid bodies. Thus the ventral side of the starfish is positively stereotropic; in other words, the starfish, off the bottom, becomes restless if its ambulacral feet are not in contact with solid bodies. If earthworms are placed in a transparent closed vessel they appear to be positively stereotropic. As soon, says Loeb, as they reach an angle in the aquarium they remain there, crawling along where the glass can touch them on two sides. This form of tropism plays, says Loeb, a very important part in the processes of pairing and in the formation of organs. The tendency of many animals to creep into cracks and crevices has, he claims, "nothing to do with self-concealment, but only with the necessity of bringing the body on every side in contact with solid bodies." The eel is positively stereotropic. It is forced to bring every part of its body, as far as possible, in contact with solid bodies. Every segment of the eel's body is stereotropic, and if touched with the finger on one side there result positively stereotropic curvatures toward the finger. There is in such an act no more consciousness than in the boring of a root in the sand (Loeb). Stereotropism is called 'thigmotropism' by some authors. Another form of tropism is traumatotropism.

Consult Loeb, *Comparative Physiology of the Brain and Comparative Psychology* (New York, 1902); also Wheeler, "Anemotropism and Other Tropisms in Insects," in *Archiv für Entwickelungsmechanik der Organismen*, vol. viii. (Leipzig, 1899).

TROPPAU, trŏp′pou. The capital of Austrian Silesia, on the right bank of the Oppa, 37 miles northeast of Olmütz (Map: Austria, F 2). It has a Gothic church, a castle, a library of 35,000 volumes, and a museum of natural history and antiquities; also the Franz-Josef Museum of art and industry, the provincial insane asylum, etc. Troppau manufactures large quantities of cloth for army use; also stoves, machines, etc. It was founded in the thirteenth century. At Troppau, in the fall and winter of 1820, a congress of European monarchs assembled for the purpose of dealing with the revolutionary disturbances in Italy. It was one of the series of European congresses which under the inspiration of Metternich (q.v.) sought to check the spread of liberal ideas and to carry out the policy of the Holy Alliance (q.v.). Population, in 1900, 26,725.

TROS′SACHS. A picturesque and well-wooded valley in Perthshire, Scotland, between Lochs Acray and Katrine, eight miles southwest of Callander, amid hills rising from 1851 feet to 2390 feet in height (Map: Scotland, D 3). It has been a great tourist resort since its immortalization by Sir Walter Scott in *The Lady of the Lake* and *Rob Roy.*

TROTTING (from *trot,* from OF., Fr. *trotter,* probably from OHG. *trottôn,* to tread, MHG. *trotten,* to run, frequentative of OHG. *tretan,* Ger. *treten,* to tread, step). A gait of the horse. Notwithstanding that the foundation of America's trotting stock came from England, and that in Russia there are the celebrated "Orloff" trotters and another breed in Norway, the trotting racer of to-day is distinctly the product of America. The gait was known to the ancients, but was abominated by them. Trotting was a favorite gait among the English sportsmen of Suffolk and Lincolnshire at the end of the eighteenth century, and a special breed there performed wonders; "Locksmith's gray" trotted 72 miles in 6 hours in 1762. Ten years later, a Lincolnshire horse trotted 30 miles in 2 hours and 10 minutes, with a rider weighing 220 pounds, and "Phenomena" 17 miles in 53 minutes. Yet as an historical fact American trotters owe nothing to these fast English trotters, but everything to the thoroughbred. The modern trotter may be traced back to "Messenger," who was imported in 1788 by Thomas Benger, of Bristol, Pa. His father was "Blaze;" his grandsire "Flying Childers;" his great-grandsire the "Darley Barb." His mother's father was "Turf," who was directly descended from the "Godolphin Barb." So on both sides of his pedigree "Messenger" brought the most select thoroughbred blood into America. He was a running-bred horse, yet from him the American trotter derives its dominant characteristics, the grit of the Arab, the gentleness of the Barb, and the hardy endurance of the English thoroughbred. The Hambletonians, comprising 90 per cent. of the American trotters, are derived from "Messenger" on both sides through Rysdyk's "Hambletonian," "Abdallah," and "Mambrino Messenger." "Hambletonian's" dam was the Charles Kent mare, the daughter of "One Eye," and granddaughter of "Silver Tail," who was the daughter of "Messenger." Hambletonian's family includes "Dexter," 2m. 17½s.; "Goldsmith's Maid," 2m. 14s.; "Rarus," 2m. 13¾s.; "Saint Julien," 2m. 11¼s.; "Jay Eye See," 2m. 10s.; "Maud S.," 2m. 8¾s.; "Sunol," 2m. 8¼s.; "Nancy Hanks," 2m. 4s.; "Alix," 2m. 3¾s.; and "Directum," 2m. 5¼s. The second great trotting family, the Mambrinos, great for racing quality and beauty, is derived on the father's side from "Messenger," and on the mother's from imported "Paymaster." The mingling of the blood of the Hambletonians and "Mambrino Chief" has resulted in such ideal trotters as "Azota," 2m. 4¾s., and "Cresceus," 2m. 2¼s. The founder of the Ceay family was "Young Bashaw," by "Grand Bashaw," an imported Barb, but on the female side are "Messenger's" progeny. The Star family, too, on the mother's side came from the same horse.

In the early trotting days colts were never trained; only matured horses raced, and they were capable of feats of endurance which no modern horse is or could be called upon to perform. "Fanny Jenks" in 1845 trotted 101 miles in 9 hours, 57 minutes, drawing a sulky weighing 150 pounds. "Lady Suffolk" beat "Dutchman" two three-mile heats in 1m. 40½s. and 7m. 56s. respectively, and she trotted her fastest mile when twelve years old. "Goldsmith's Maid" trotted a mile in 2m. 14½s. when she was seventeen years old. She started 118 times and beat 2m. 30s. in 115 of them, and "Maud S." made her then world's record, 2m. 8¾s., when she was eleven years old. These times, too, were all before the days of the kite-shaped tracks, banked and rolled with scientific nicety, and long before the rubber-tired wheel sulky, both of which inventions have helped to reduce the mile record. On August 17, 1903, at the Brighton Beach (N. Y.) track, the trotting record was reduced by J. K. Billings's "Lou Dillon" to two minutes, but in October of the same year the stallion "Cresceus" lowered it to 1m. 59¾s. The weather conditions were perfect. A few days afterwards "Lou Dillon" regained her laurels by still further reducing the record to 1m. 58½s. Weather conditions were unfavorable, but the mare had the advantage of two pacemakers, one drawing a wire-net guard.

For pleasure driving and friendly road competitions a light wagon was in use as early as 1786, but not until after that did the trotter as a racer become prominent. In that year "Boston Blue" trotted a mile in little less than three minutes. By 1825 the New York Trotting Club was formed, and dashes of speed were daily indulged in on what is now Third Avenue, from the Bull's Head to Harlem. Up to 1898, however, the great bulk of the trotting of the country was done on tracks, 2000 of which were scattered over the continent. These tracks on which regular races are held are either exactly one mile or half a mile from start to finish, and a horse must win two heats to win the race. The courses are in the main elliptical, though some, built after 1890, are kite-shaped.

Since 1898 a great impetus has been given to trotting competitions by the creation of civic speedways, the first of which was constructed by the municipality of New York, along the banks of the Harlem River, from 155th Street to Fort George. Many great cities throughout the country have followed the example.

TROTWOOD, Betsy. In Dickens's *David Copperfield,* the hero's great-aunt, an eccentric but tender-hearted woman, with a special abhorrence for donkeys.

TROUBADOURS (Fr. *troubadour*, from Prov. *trobador*, troubadour, from *trobar*, OF. *trover*, *trouver*, Fr. *trouver*, to find, compose). The mediæval poets of Southern France, who flourished from about 1100 to about 1400, singers of war and love, whose wandering lives, full of passion and adventure, have made them the typical romantic figures of their age. The feudal conditions of the region to which they belonged were particularly favorable to the development of this race of bards. Here, as elsewhere, society was divided into three classes, commons, clergy, and nobles, of whom the nobles alone possessed either the means or the desire liberally to reward literary and musical skill. The nobility, moreover, consisted of an agglomeration of petty independent barons, who tended to attach themselves to powerful local houses, such as that of the counts of Toulouse. There were, therefore, many courts, not too far distant from each other, to which the wandering minstrels could resort. Another social condition which had an important influence upon the character of Provençal poetry was the position of noble ladies. They received fiefs, sometimes by inheritance, sometimes as dowry, and there are instances in which they even governed and presided over a court. Usually married young and for social and political reasons rather than for love, they became queens of society, the objects often of fervent passion, always of conventional adoration.

With the accumulation of wealth and the progress of refinement, delight in life became conspicuous. The love of splendor manifested itself in gorgeousness of dress and magnificence of entertainments. Prodigality was the fashion. The ideal prince was he who bestowed gifts lavishly. In addition to the chase and the tourney, one of the favorite amusements of this society was song, an amusement supplied by the jongleurs and the troubadours. The jongleurs (*joculatores*) were the successors of the Latin *mimi.* They wandered from town to town, from castle to castle, and supplied amusement to the commons at the fairs and in the market-place, and to the higher classes at their feasts. The meaner kind not only recited, sang, and played on musical instruments, but performed as jugglers, dancers, acrobats, and exhibitors of trained animals. Members of this class were also to be found in the following of every great lord, among his permanent domestic servants or *ministeriales.* They fulfilled the function of Court minstrels and entertainers.

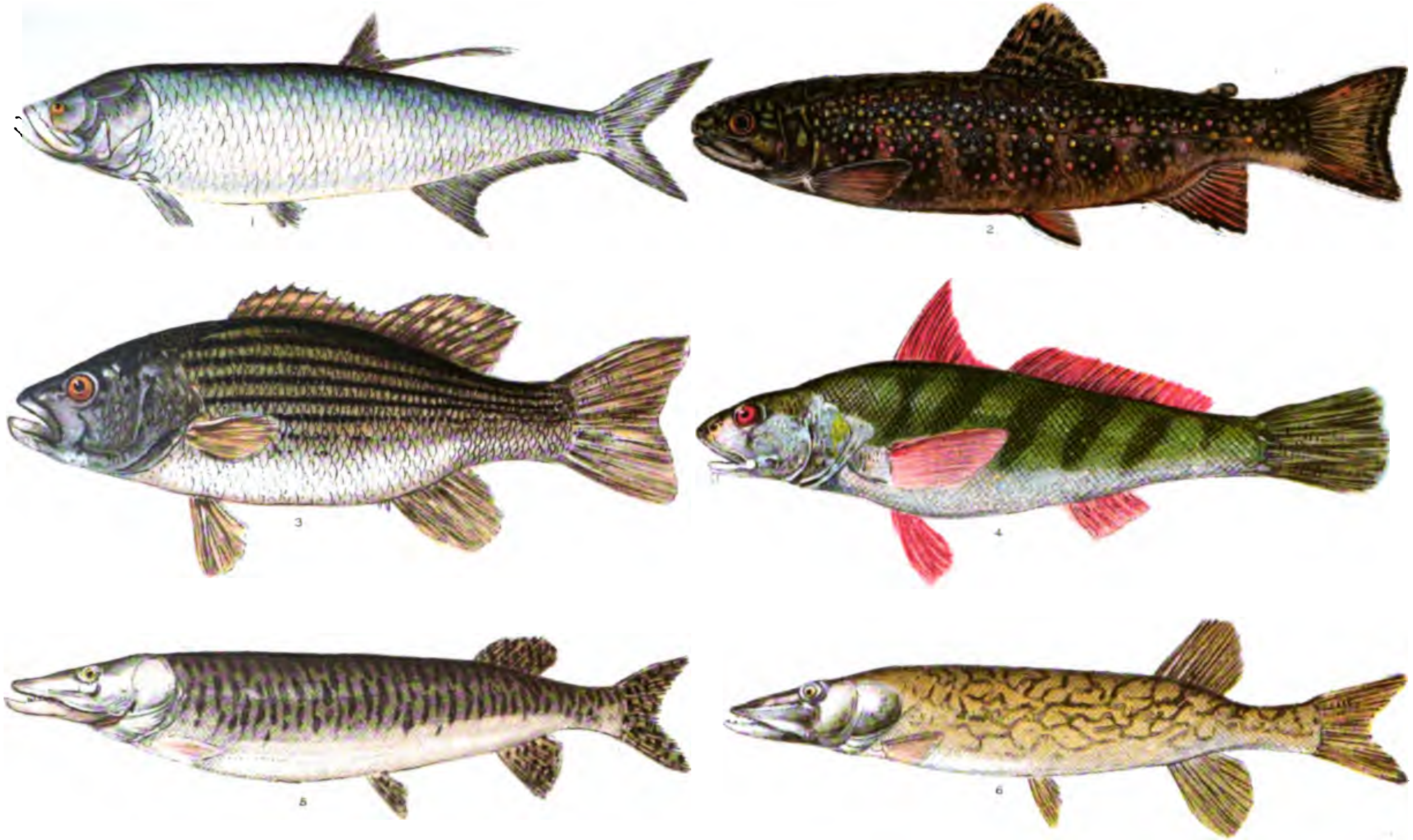
From such singers sprang the troubadours. In general, it may be said that the jongleur was one who made a trade of poetry and music; the troubadour one who devoted himself to the production of artistic Court poetry, whether he did this for gain or not. The jongleurs were, therefore, always poor, either by origin or by fate, whereas the troubadours, though largely belonging to the humble or the middle class, included knights, barons, counts, and even kings.

Most of the troubadours led a wandering life, though they often lingered for several years at the Court of some patron, praising the mistress of the mansion in extravagant terms, and supporting the policy of its master by vigorous exhortations to his friends or by bitter denunciation of his enemies. War and lady service were the chief themes of their songs. (See PROVENÇAL LITERATURE.) Conventional as this poetry was, there were no schools in which the art was taught. Each troubadour learned from his predecessors, and handed down the tradition to the next generation. Even the art of writing was not necessary, for the pieces were not prepared for readers, but for hearers. They were almost always sung by the composer himself, to his own accompaniment, but those masters who could not sing taught the words and music to their jongleurs. This was also the natural mode of publishing a poem destined for a wider audience than could be reached by the individual author. Poets of high rank, moreover, had their pieces performed by servants, and whenever a lyric was sent to some friend at a distance it was not intrusted to writing, but to the voice of a messenger. This poetry, therefore, required a pleasure-loving aristocracy for its audience, and wealthy and generous patrons for its support. It mirrored the soul of chivalry, an ideal of heroism, generosity, courtesy, and love. For flattering the vanity of the nobles and lending his talent to their taste for pleasure, the singer was rewarded with gifts of money, weapons, horses, or garments. Generosity was naturally praised as the chief of princely virtues, and growing avarice was a sign of the hopeless degeneracy of the times. Richard Cœur de Lion was considered the mirror of knighthood, and the practical statesmanship of Philip Augustus of France was judged low and unworthy. With the disappearance of the society they represented, the troubadours also vanished.

The first troubadour whose lyrics have been preserved was William IX., Count of Poitou and Duke of Aquitaine, but he must have had a long line of humble forerunners. His granddaughter, Eleanor, the quick-witted but licentious wife of Louis VII. and Henry Plantagenet, was the theme of the impassioned songs of Bernart de Ventadour. Ermengarde of Narbonne was another celebrated patroness of poetry, with many adorers in verse. This was, indeed, the flourishing period of the troubadours. Among their chief patrons were the counts of Provence, the counts of Toulouse, and several kings of Aragon and Castile, the most notable of whom was Alfonso II. of Aragon. In Italy the lords of Este and the Emperor Frederick II. harbored the singers of Languedoc. At these courts minstrels were kindly received and lavishly rewarded, taking part, apparently, in the social pleasures mirrored in their songs. This gay life, however, was not without its bitterness, and many a troubadour retired to a convent to pass his declining years in repentance.

Much of the romantic interest that has gathered about the careers of these poets is derived from the Provençal biographies and *razos* which are found in some of the manuscripts containing their works. Many of these are merely imaginative tales in which elements of folk-lore, combined with a fanciful interpretation of the poems, have been set down as fact. Growing up among the later jongleurs and other lovers of poetry, they represent the conception which the succeeding age had formed of the heroes of Provençal song. Another fact has tended to give a romantic coloring to the lives of the troubadours: the

AMERICAN GAME-FISHES



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO. LITH. N.Y.

1 TARPON $1/15$ NATURAL SIZE – MEGALOPS THRISSOIDES
2 TROUT $1/4$ „ „ – SALVELINUS FONTINALIS
3 BASS $1/6$ „ „ – MORONE LINEATA
4 KINGFISH $1/15$ NATURAL SIZE – MENTICIRRHUS SAXATILIS
5 MASKINONGE $1/12$ „ „ – ESOX NOBILIOR
6 PICKEREL $1/4$ „ „ – LUCIUS AMERICANUS

fact that their poems deal so largely with the subject of love. This love was, it is true, chiefly factitious and conventional, rather than personal, and the formulas in which it was expressed are exceedingly monotonous; but the modern imagination has built up for these wandering minstrels a sort of butterfly existence of poetry and passion, to which is added the excitement of constant adventures. That such a picture does not represent the truth is obvious, but it is intensely fascinating, and the troubadours will probably long continue to be regarded as sentimental heroes.

Bibliography. The best work on the subject for English readers is Justin H. Smith, *The Troubadours at Home*, with bibliography (New York, 1899), a popular view of the troubadour country, stories of their adventures, and translations of their poems, together with copious and scholarly notes. Less exact and scholarly are Hueffer, *The Troubadours* (London, 1878); Rutherford, *The Troubadours; Their Loves and Their Lyrics* (ib., 1873); Rowbotham, *The Troubadours and the Courts of Love* (ib., 1895). The best edition of *Les biographies des troubadours* in Provençal is that by Chabaneau (Toulouse, 1885). Most of these biographies have been translated by Ida Farnell, *Lives of the Troubadours from the Mediæval Provençal* (London, 1896). Consult also the authorities referred to under Provençal Literature.

TROUBETZ′KOY, Princess Amélie (Rives). See Rives, Amélie.

TROUP, George McIntosh (1780-1856). An American politician, born in the present Washington County, Ala. He graduated at the College of New Jersey (Princeton) in 1797, was admitted to the bar in 1800, and began to practice in Savannah. From 1801 to 1804 he was a member of the Georgia Legislature; was a member of the United States House of Representatives from 1807 to 1815; was chairman of the Military Committee during the War of 1812, and opposed vigorously the Yazoo compromise. From 1816 to 1818 he was in the United States Senate, and from 1823 to 1827 was Governor of Georgia. During the dispute which arose between the agents of the general Government and the State in regard to the extinguishment of the Creek title to lands in Georgia, he did not hesitate to defy the Federal Government. From 1829 to 1833 he was again a member of the United States Senate. He was a strong defender of States' rights, and in 1833 presided over the Georgia States' Rights Convention.

TROUS-DE-LOUP, tro͞o′ de-lo͞o′, or Wolf-holes. A device formerly much used in military fortifications. It consisted of funnel-shaped holes, 6 feet deep, with an exterior diameter of 4½ feet, having one or more pointed stakes at the bottom. They were placed near the approaches and the glacis, and were designed to break the ranks of the attacking force. The principle is still retained in the modern shallow military pits, and other forms of military obstacles, wire entanglements, etc.

TROUT (AS. *truht*, from OF. *truite*, from Lat. *tructa*, *tructus*, from Gk. τρώκτης, *trōktēs*, sort of sea-fish, from τρώγειν, *trōgein*, to gnaw). Any of many fishes of the family Salmonidæ. (See Salmon.) Some are partly anadromous, but most of the species live exclusively in fresh waters, and occur in most of the lakes and streams of northern regions. They are all voracious and more or less gamy. Their food consists of almost any sort of fresh animal matter—smaller fishes, crustaceans, insect larvæ, and the like. The trout, like the salmon, spawn during the colder months of the year, varying with the latitude and the species.

Trout may be classed into two main groups. The one group, belonging to the genus Salmo, has a flat vomer, supplied with teeth, the body with larger scales than the other group, which has a boat-shaped vomer, the shaft destitute of teeth. The latter group is more perfectly restricted to fresh waters than the former. The former group includes the salmon-trout, and the latter the chars, such as the brook trout. The salmon-trout of European waters (*Salmo trutta*) resides in salt water, and enters the rivers to spawn. Its fresh-water variety, the brown trout (*Salmo fario*), occurs in the lakes of Europe, and has been extensively domesticated in English and North American waters. Another Scottish variety, the Lochleven trout, differs from the brown trout in the greater growth of the pectoral and caudal fins, in the greater number of cæcal appendages, and in other minor characters.

The American salmon-trout (*Salmo Gairdneri*) is a large trout, abundant in the Columbia and other rivers flowing to the Pacific coast. (See Steelhead.) A variety of it, the Kamloops trout, or 'stit-tse,' occupies the lakes of British Columbia and northern Washington.

The rainbow or Coast Range trout (*Salmo irideus*) is smaller than the preceding, has larger scales and brighter colors. It is native in the mountain streams of the Pacific Coast, and probably enters the sea. It is very variable, presents many geographical varieties, such as the brook trout of western Nevada, the trout of Mt. Shasta, golden trout of Mt. Whitney, the McCloud River trout, and others. It has been transplanted successfully into the mountain streams of the Eastern United States, and has been domesticated to some degree. The 'cut-throat' or Rocky Mountain trout (*Salmo mykiss*) is a common trout of very wide distribution in all the clear streams of the Rocky Mountains and Sierra Nevada, from Kamtchatka and Alaska to Northern Mexico. Its scales are smaller than in the nearly related species, hyoid teeth are usually present, and it is very closely related to *Salmo Gairdneri*. This species often enters the sea, and is very variable, many geographical races being recognized, one of which, 'Clarke's trout' of the Columbia River, is illustrated on the Plate of Salmon.

The Great Lakes trout, 'longe,' 'togue,' or 'namaycush,' differs from *Salmo* in the absence of teeth on the shaft of the vomer, and from the brook trout in its larger size and well-developed teeth on the hyoid bone. It inhabits all the larger lakes of Eastern North America, and is one of the more important food-fishes of the Great Lakes region. The variety 'siscowet,' found only in the deep waters of Lake Superior, has excessively fat flesh, and is not prized as food. See Namaycush.

The principal chars of American waters are the common brook or speckled trout, the Dolly Varden, the oquassa, and the European brook trout. The brook trout (*Salvelinus fontinalis*) is the best known, abundant in all clear, cold streams of Eastern North America south to the headwaters of the Savannah. It differs from the other species of the genus in its back being strongly marbled with olive and black. It has been introduced into the Western streams; and many hybrids between this and the rainbow trout and other species exist. Its extreme length may be 18 inches, but it is usually much smaller. It is a favorite for its gamy qualities and for its flavor. See Colored Plate of GAME FISHES.

The Dolly Varden trout (q.v.), or malma, is a native of Northwestern America, and has red spots on both back and sides. The oquassa trout (*Salvelinus oquassa*), 'quasky' or 'blueback,' is a small trout of the Rangeley group of lakes in western Maine, dark blue, with small red spots, usually confined to the sides. Similar and still smaller varieties of this most beautiful of the trout exist in the lakes of Quebec and in those of subarctic America.

The European brook trout (*Salvelinus alpinus*) has the red spots only on the sides, and the mouth is rather smaller than in the preceding. It occurs in the cold lakes and mountain streams of Northern Europe and Asia, and in Northeastern North America. It is variable and is represented by several varieties—such as the Greenland char, the long-finned char, and the sunapee or golden trout. The last named is very local in its distribution, having been taken in Sunapee Lake and a few other lakes in New Hampshire and Maine. It is highly prized because of its brilliant colors and graceful form. Much uncertainty remains as to its origin and relationship. It has strong affinities with the European form and by some is considered to have been introduced from there. Much pains is being taken to increase this species by artificial propagation and transplantation. See FISH CULTURE.

There are other species of trout of minor importance both in America and Europe and Asia; and many fishes not truly trout are locally so called. Compare SALMON; GRAYLING. Consult authorities cited under ANGLING; FISH; SALMON; and Jordan and Evermann, *American Food and Game Fishes* (New York, 1902).

See Plates of AMERICAN GAME FISHES; SALMON; TROUT AND GRAYLING.

TROUT FISHING. With the possible exception of the black bass, there is no fish that affords more sport to the angler or that is found over a greater range of country than the brook trout. It may be taken with the fly or with bait, but the former method is considered generally the more sportsmanlike. In bait fishing, the trout is likely to be killed or badly injured, whereas in fly fishing the fish generally is hooked in the lip and can be returned to the water unharmed. In lakes and ponds in summer time, when the surface of the water becomes warm, trout make for deep water, and bait must be used. It is impossible to do more than give the general rules controlling the selection of flies: In size, the fly should be selected to meet the condition of the water rather than the size of the fish; thus, if late in the season and the water of a clear stream is low, sober-colored flies on No. 10 or 12 hooks are usually the best. See FISHING; FLY-CASTING.

TROUT-PERCH. One of the small fishes of the North American family Percopsidæ, represented abundantly in the Great Lakes by the 'sand-roller' (*Percopsis guttatus*) and by a second genus and species in Oregon. This family constitutes the suborder Salmopercæ; the form of the body and the head and mouth are perch-like, while the fins are salmon-like. These fishes are of particular interest because of their relationship with generalized archaic forms, of which they seem to be the survivors. Consult Jordan and Evermann, *Fishes of North and Middle America* (Washington, 1896).

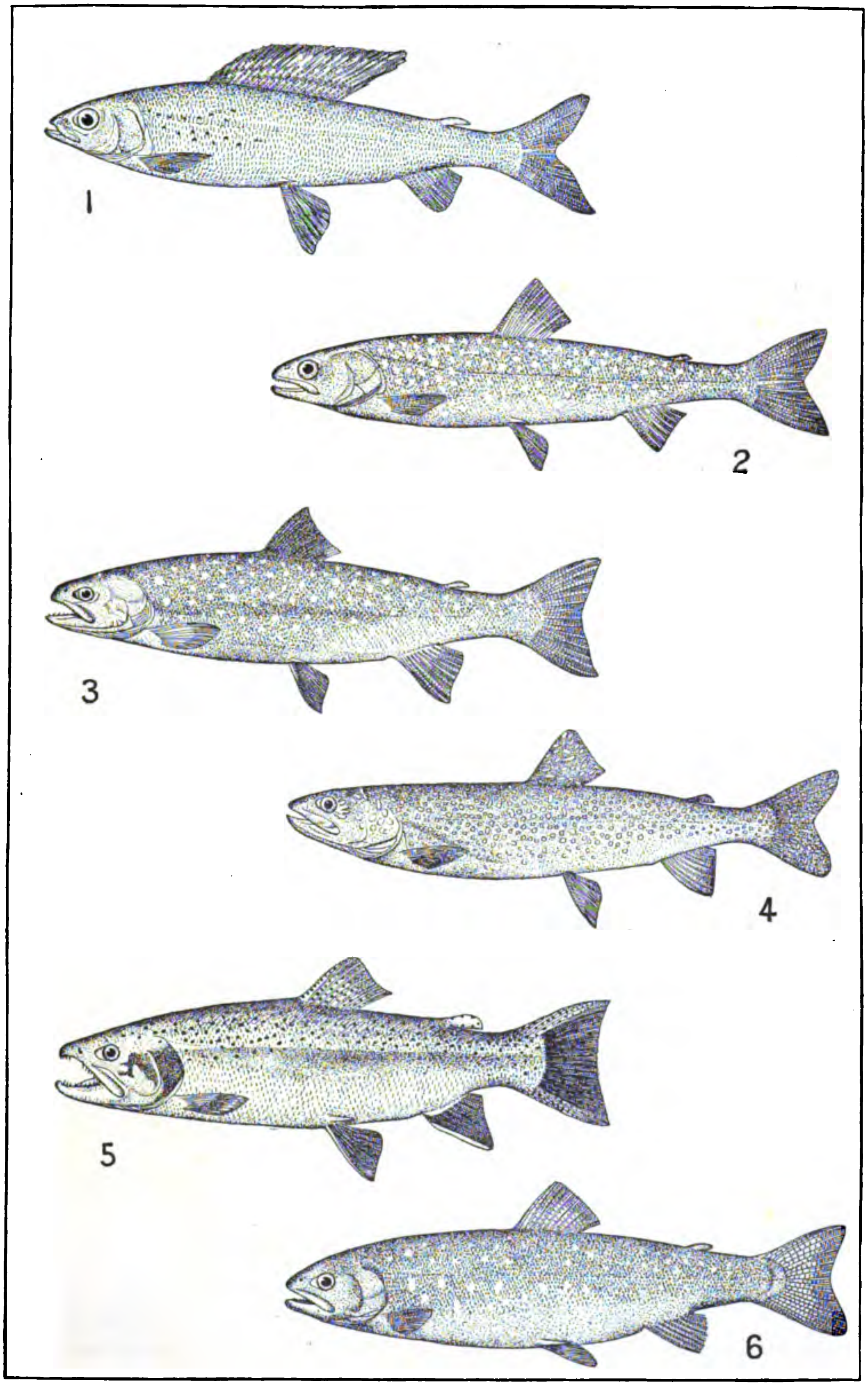
TROUVÈRE, trōō'vâr' (Fr., from *trouver*, to find, compose). The Northern French term answering to the Provençal troubadour (q.v.), applied usually to the original poets who composed the works which the jongleur performed. The distinction, however, is not absolute, as there are instances of trouvères who performed their own works, and occasionally of jongleurs who aspired to composition. The trouvère was usually a man of some rank and standing, either priest or knight. See JONGLEUR; FRENCH LITERATURE.

TROUVILLE, trōō'vēl'. A fishing town and seaside resort of the Department of Calvados, France, at the mouth of the Touques, 136 miles by rail west-northwest of Paris, and 9 miles south of Havre. It has risen from a humble fishing village to the rank of the most fashionable watering-place in France. Its equable climate, agreeable situation, remarkably fine beach, and many handsome villas make it an ideal resort during the summer and autumn months. There are a Louis XIII. Hôtel de Ville and a large and well-appointed casino. The harbor is thronged with fishing boats, and there is some trade. Population, in 1900, 6137. The port is shared with Deauville, a small but well-known sea-bathing resort, a short distance southwest, with a casino. The August races here are attended by the leading circles of Parisian society.

TROVER (OF. *trover*, *trouver*, to find, compose). One of the old forms of action in common-law pleading, employed to recover damages for the wrongful conversion of personal property. It is based upon a fiction that the plaintiff has lost his chattels and that the defendant has casually found them, but refuses to deliver them to the plaintiff. Although this fictitious statement must be made in the declaration, it need not be proved, and the plaintiff may recover damages on proof of a conversion of his property. Any interest which will entitle a person to the possession of goods is sufficient to maintain this action. See FORMS OF ACTION; COMMON FORMS.

TROW'BRIDGE. A market town in Wiltshire, England, on a rocky eminence in the valley of the Biss, 10 miles southeast of Bath (Map: England, D 5). Cassimeres, kerseys, tweeds, and woolen cloths of the best qualities are manufactured. The parish church of Saint James, which dates from the fourteenth century, contains the remains of Crabbe, the poet, who officiated as clergyman from 1814 to 1832. There are a fine modern town hall and many handsome villas, the residences of wealthy manufacturers. The town owes its origin to an ancient castle, built on the mound called Courthill,

TROUT AND GRAYLING



1. **MICHIGAN GRAYLING** (Thymallus tricolor).
2. **OQUASSA TROUT** (Salvelinus oquassa).
3. **DOLLY VARDEN TROUT** (Salvelinus malma).
4. **NAMAYCUSH** (Cristivomer namaycush).
5. **RAINBOW TROUT** (Salmo irideus).
6. **SUNAPEE TROUT** (Salvelinus alpinus, var. aureolus).

which held out for Matilda against Stephen. It was demolished before the reign of Henry VIII., and all traces of it have disappeared. Population, in 1891, 12,046; in 1901, 11,562.

TROWBRIDGE, Edmund (1709-93). An American lawyer, born in Newton, Mass. He graduated at Harvard in 1728, and soon rose to eminence as a lawyer. He became Attorney-General of the State in 1749, was for several years a member of the council, and in 1767 was appointed a justice of the Massachusetts Supreme Court, presiding with great ability and fairness at the trial of Captain Preston and his men after the Boston massacre. In 1772 he retired to private life. Though not in full sympathy with the Patriot Party, he was strongly opposed to the policy of the British Ministry. He has been regarded as the most profound jurist in New England before the Revolution.

TROWBRIDGE, John (1843—). An American physicist. He was born in 1843 and was educated at the Lawrence Scientific School of Harvard University, graduating in 1866 and then serving for three years as tutor. After occupying a chair at the Massachusetts Institute of Technology, he returned to Harvard in 1880 and was made professor of experimental physics, and was appointed in 1888 to the Rumford professorship of the application of science to the useful arts. He established a laboratory course in physics and was one of the pioneers in introducing laboratory work as an essential part of instruction in elementary science. Trowbridge carried on many important investigations in physics, particularly in electricity, and later investigated the various phenomena connected with the Roentgen rays. Many of his communications were issued under the title of *Contributions from the Physical Laboratory of Harvard College.* Besides these, he wrote *The New Physics* (1884).

TROWBRIDGE, John Townsend (1827—). An American novelist, juvenile writer, and poet, born in Ogden, N. Y. After a common school education, supplemented at home, Trowbridge taught school for a year in Illinois and afterwards worked as a journalist in New York and Boston. His first work of distinction, *Neighbor Jackwood* (1857), was one of the first realistic novels of New England life. The more noteworthy of his many stories, which include some of the most wholesome of American fiction for boys, are *Father Bright Hopes* (1853); *The Drummer Boy* (1863); *Cudjo's Cave* (1863); *The Three Scouts* (1865); *Neighbors' Wives* (1867); *Coupon Bonds and Other Stories* (1872); *The Jack Hazard Series; The Toby Trafford Series; The Start in Life Series; The Tide Mill Series.* Noteworthy collections of verse are: *The Vagabonds and Other Poems* (1869); *The Emigrant's Story and Other Poems* (1875); *The Book of Gold and Other Poems* (1877); *A Home Idyl and Other Poems* (1881); *The Lost Earl and Other Poems* (1888); *Poetical Works* (1903), a collected edition. His autobiography, *My Own Story* (1903), throws much light on American literature and life during the second half of the nineteenth century.

TROWBRIDGE, William Petit (1828-92). An American engineer, born in Oakland County, Mich. He graduated, first in his class, at West Point in 1848; was assigned to the Corps of Engineers as a brevet second lieutenant; was engaged in making astronomical observations at the Military Academy Observatory in 1848-50, and from 1850 to 1856, when he resigned from the army, was engaged in important work on the United States Coast Survey. In 1856-57 he was professor of mathematics at the University of Michigan; and in 1857-61 was scientific secretary of the Superintendent of the United States Coast Survey. From 1861 to 1865, during the Civil War, he was in charge of the Engineer Agency at New York City. Subsequently he was professor of dynamic engineering in the Sheffield Scientific School of Yale College from 1870 to 1877; was adjutant-general of the State of Connecticut from 1872 to 1876; and from 1877 until his death was professor of engineering in the Columbia School of Mines. He is credited by some with having first suggested the idea of the cantilever bridge. Besides numerous magazine articles, he published *Heat as a Source of Power* (1874).

TROY (Lat. *Troia*, from Gk. *Τροία*). The most famous city of Greek legend. It was situated in the northwestern corner of Asia Minor, in a small plain through which, from the southeast, flows to the Hellespont the ancient Scamander (now Mendere), entered a short distance from its mouth by a small stream from the east, the ancient Simoïs (now Dumbrek Su). In the angle once formed by these streams (the modern courses have altered greatly) lies a low hill, jutting from the range of Mount Ida, which was known in Roman times as *Ilium Novum*, and was regarded by many as the successor of the Homeric Troy. Near by is the modern village of Hissarlik. The claims of this site had always found defenders, but since the work of Le Chevalier at the end of the eighteenth century there had been a strong trend of scholarly opinion in favor of the ruins near Bunarbashi on the Bali Dagh, a steep cliff over the Scamander, south of its entrance to the plain. The presence of warm springs near by also served to strengthen this identification. The site, as well as the summit on the opposite side of the valley, was certainly fortified in very early times as a protection against incursions from the south, but excavation has shown conclusively that the capital of the district lay on the hill of Hissarlik, rather less than four miles from both the Ægean and Hellespont, and corresponding far more closely than could have been reasonably expected with the topographical indications of the *Iliad.* The credit for the exploration of this site belongs to Heinrich Schliemann (q.v.), who began excavations in 1870, and in the three following years had laid bare enough to show that underneath the Roman and later Greek ruins which crowned the hill were remains of a settlement of unknown antiquity, even though the names "Scæan Gate" and "Priam's Palace" seemed extravagant. In 1878-79 another campaign with scientific coadjutors led to more definite results, which were still further increased by the excavations of 1882 by Schliemann and Dörpfeld. Another visit in 1890 led to further important modifications of previous results, and though the death of Schliemann in December, 1890, prevented the immediate continuation of the work, it was resumed in 1893 by Dörpfeld.

The history of the hill as read in the excavations and later writers is that of a series of at least nine successive settlements, many of which were only small collections of wretched huts, though a convenient terminology has dignified them all as 'cities.' The first (1) settlement is a small group of dwellings surrounded by a wall, belonging to the end of the Neolithic Period. The second (2) city, held by Schliemann to be the Homeric Troy, was defended by a strong wall of rough stone, topped by crude brick, and seems to have extended its circuit twice, the second time with marked alterations in the situation of the gates. Within were several houses, consisting of a great hall and vestibule, of the type found later in Mycenæ and Tiryns, and apparently described in the Homeric poems. The civilization indicated by the pottery and lesser finds shows that the inhabitants were at the beginning of the Bronze Age, belonging to the period of the so-called "Island" civilization. (See ARCHÆOLOGY.) The rulers were evidently of some wealth and power, but their identity seems lost forever. The continuity of tradition in the pottery and general type of building, and the similarity with much found in Phrygia, seem to warrant the belief that there was no change of race from the second to the sixth city, and that this people were kindred of the Indo-European Phrygians. Yet they were not at peace with their neighbors, as is shown by the fact that the second city was burned, and the site left desolate. The place was resettled, however, and the houses of the third (3) city were built on the rubbish which concealed their predecessors; the wall also was repaired, and the gates narrowed for greater security. This city, too, was destroyed, or perhaps abandoned, but was again resettled (4), as an open village. To this succeeded (5) another village of little huts, defended by a wall of no very great strength. The next city (6) was, however, of a very different sort. It was defended by a strong wall of smoothed stone, of far greater circuit than that of the city No. 2, and of such workmanship that a bit discovered by Schliemann was attributed to the Hellenistic period. This wall was pierced by gates, provided with strong flanking towers. Within were houses of considerable size, but of the same simple plan as those in the second city. Owing to a great terrace built by the Romans, which cut down the top of the hill, the remains of this city are only preserved around the edge, while the centre, which doubtless contained the royal palace, has vanished. As Schliemann's excavations were almost entirely confined to the centre of the hill, it was possible for him to miss this city, which belonged to the Mycenæan period, and certainly corresponds to the Homeric Troy. It seems clear from the objects found, that the kings of Troy, though powerful enough to build strong walls, ruled over a people less advanced in artistic work. The old plain pottery continued in general use, and the Trojan imitations of the imported Mycenæan ware, while good in form and color, show conspicuous deficiency in the characteristic graceful decoration. The remains clearly show that this royal castle was destroyed by fire, and also that after no very long period another settlement (7) covered the hill. Mycenæan vases have been found in its lower strata, but whether the inhabitants were survivors of the Trojans, or the first wave of Greek settlers, cannot with certainty be determined. It is clear, however, that the Cimmerian invasion in the eighth century B.C. reached this hill, and after destroying the inhabitants, either Treres or Cimmerians took up their abode on the site, till in the seventh century they were driven forth and Troja or Ilion was occupied by Greeks (8). The settlers seem to have been a small band of Æolian colonists, who were cut off from the sea by other Greek towns, and seem to have lived with little to recall the ancient glory of the place. The prosperity of the place (9) began with the visit of Alexander in B.C. 334, and the Temple of Athena Ilias became after his death the centre of a league of free cities of the Troad. Near the end of the fourth century Lysimachus fortified it with a wall some five miles in circumference, and also built on the hill a marble Temple of Athena. Later the town was under the control of Seleucus, but its history during this time is obscure. It passed under the Roman protection B.C. 189, and was honored as the city of Æneas, and thus the parent of Rome. In the first civil war, about B.C. 85, it was stormed and sacked by the Marian Fimbria. New prosperity came with Julius Cæsar, for the Julian family traced their descent from Ascanius, and Augustus rebuilt the Temple of Athena and surrounded it with courts and porticoes. Later emperors favored it, and Constantine planned to make it the seat of his new capital. It was for a long time the seat of a bishopric, but was plundered about 1306 by the Turks and since then has lain in ruins.

For the legendary history of Troy, see TROJAN WAR.

BIBLIOGRAPHY. The excavations of Schliemann and Dörpfeld are published in *Trojan Antiquities* (London, 1874), *Ilios* (ib., 1881), *Troja* (ib., 1884); *Bericht über die Ausgrabungen in Troja im Jahre 1890*, von H. Schliemann und Dörpfeld (Leipzig, 1891); Dörpfeld, *Troja, 1893* (ib., 1894); and finally in the definitive work by Dörpfeld and others, *Troja und Ilion* (Athens, 1902). Consult also Schuchardt, *Schliemann's Excavations*, trans. by E. Sellers (London, 1891).

TROY. The county-seat of Pike County, Ala., 52 miles south by east of Montgomery, on the Plant System and the Central of Georgia railroads (Map: Alabama, D 4). It is the seat of a State normal school. Troy is the shipping centre for large cotton interests, and has some manufactures, of which fertilizers are the most important. The government, under the charter of 1870, is vested in a mayor, chosen every two years, and a unicameral council. The water-works and the electric light plant are owned and operated by the municipality. Troy was settled in 1843 and incorporated the same year. Population, in 1890, 3449; in 1900, 4097.

TROY. An important manufacturing city and the county-seat of Rensselaer County, N. Y., on the Hudson River, at the head of steam navigation, 6 miles above Albany, and 151 miles north of New York City (Map: New York, G 3). It is on the New York Central and Hudson River, the Delaware and Hudson, the Boston and Maine, and the Rutland railroads; and additional means of transportation is afforded by the Erie and the Champlain canals on the opposite side of the river. Four bridges here span the Hudson, including that of the Delaware and Hudson Railroad and the Congress Street Bridge; also the Waterford Bridge, finished in 1804, the oldest wooden covered bridge in the United States.

Troy is situated partly on level ground along the river front, the site rising to the east in a range of hills, the highest elevation being Mount Ida. The city is regularly laid out. There are 140 acres in the parks open to the public, of which Beman Park is the most important. Besides this, the city has acquired a new park site on Warren's Hill overlooking the Hudson. Lagoon Island, in the Hudson, midway between Troy and Albany, is a popular resort, with bath houses, athletic grounds, and other features. The Soldiers' and Sailors' Monument is in Washington Square. Oakwood Cemetery is of interest for its natural beauty; it has also a number of fine monuments and the Earl Memorial Chapel, one of the finest crematories in the world. Among edifices of note are the court-house, post-office, the savings-bank building with the music hall, the Rowe Memorial building, and the Hart Memorial building. Troy is the seat of the Rensselaer Polytechnic Institute (q.v.), one of the leading schools of its class in the country, and of the Emma Willard Seminary, one of the first schools established for the higher education of women. There are several libraries in the city. The Troy Hospital and the Samaritan Hospital are important charitable institutions; there is a fine orphan asylum in the English style of the fifteenth century; the Gurley Memorial and the Sage Memorial may also be noted.

Industrially, Troy ranks fifth among the cities of the State, its manufacturing establishments in the census year 1900 having had $23,532,000 capital and an output valued at $28,209,000. It enjoys the advantages of good water power, obtained partly from the State dam across the Hudson above the city, and of excellent transportation facilities, its railroad lines being supplemented by two great waterways, the Hudson River and the Erie Canal. The city is well known for the manufacture of shirts, collars, and cuffs, having been long the principal centre in the United States for the production of these goods. Other important manufactures are iron and steel, foundry and machine shop products, laundry machinery, engineering instruments, bells, malt liquors, hosiery and knit goods, paper and wood pulp, paints, brick and terra cotta products, and flouring and grist mill products. Among metal products stoves occupy a prominent place.

Troy is governed under the regular State charter for cities of the second class, which went into operation January 1, 1900. The government is vested in a mayor and common council, elected every two years, and in various administrative departments, for further explanation of which see paragraph on *Administration* under ALBANY. The comptroller, treasurer, police justices, and assessor are chosen by popular election; other officials are appointed by the mayor. The city clerk is elected by the common council. More than $1,000,000 is spent annually by the city for maintenance and operation, the principal items being: Schools, about $215,000; streets, $125,000; police department, $112,000; hospitals, asylums, and other charitable institutions, $89,000; municipal lighting, $83,000; interest on debt, $83,000; water-works, $77,000; fire department, $64,000. The water-works, which represent an outlay of $1,856,774, are the property of the municipality. The net debt of the city in 1902 was $2,078,534; the assessed valuation of real and personal property, $56,924,599. The population, in 1800, was 4926; in 1850, 28,785; in 1870, 46,465; in 1880, 56,747; in 1890, 60,956; in 1900, 60,651. The village of Lansingburg, which in 1900 had a population of 12,595, became a part of Troy on January 1, 1901.

The site now occupied by Troy was included in the Van Rensselaer grant of 1629, and in 1659, with the consent of the patroon, was bought from the Indians by Jan Barentsen Wemp. In 1720 Derick Van der Heyden obtained possession of a large farm here, and it was on this farm, still owned by the Van der Heyden family, that a town, most of whose early settlers were New Englanders, was laid out in 1787. The place was called Van der Heyden's Ferry and Ashley's Ferry until 1789, when the present name was adopted. In 1794 Troy was incorporated as a village, and in 1816 it was chartered as a city. Consult: Weise, *Troy's One Hundred Years* (Troy, 1891).

TROY. The county-seat of Miami County, O., 80 miles north by east of Cincinnati, on the Cincinnati, Hamilton and Dayton Railroad (Map: Ohio, B 5). Farming is the leading industry of the surrounding country. There are manufactures of carriages, wagons, bentwood, dashboards, and iron and lumber products. The water-works and the electric light plant are owned by the municipality. Population, in 1890, 4494; in 1900, 5881.

TROYES, trwä. The capital of the Department of Aube, France, on the left bank of the Seine, 104 miles by rail east-southeast of Paris (Map: France, K 3). It presents a quaint, mediæval appearance, most of the houses being of the timbered kind. The fine Cathedral of Saint Pierre (thirteenth to sixteenth century), with a splendid rose window, is in the Flamboyant style. The small Church of Saint Urbain, founded by Pope Urban IV., is a charming example of the thirteenth-century Gothic. La Madeleine has a superb rood screen. Saint Jean (fourteenth to sixteenth century) is noteworthy for its stained glass and its two paintings by Mignard. Saint Nicolas and Saint Pantaléon are both in the Gothic style of the sixteenth century. In the old Abbey of Saint Lupus are the public library (110,000 volumes and 2800 manuscripts) and an interesting museum. The monument to the children of Aube, in commemoration of the Franco-German War, was erected in 1900. The chief industry is the manufacture of cotton and woolen stockings. There is a school of hosiery. The Seine is canalized here and divides into several arms in the city. Population, in 1901, 53,146.

The capital of the Celtic *Tricasses*, Troyes was the Roman *Augustobona* (later *Trecæ*). The town was the capital of the counts of Champagne, and early rose to importance as a centre of trade. The treaty of 1420, which provided for the succession of Henry V. of England to the French throne, was signed here. Jeanne d'Arc took the town in 1429, and a century later it was partly destroyed by Charles V. The revocation of the Edict of Nantes reduced the population, which was largely Protestant, to less than one-fourth of its former numbers. Consult Boutiot, *Histoire de la ville de Troyes* (Paris, 1870-80).

TRO'YLUS AND CRY'SEYDE. A poem by Chaucer, written about 1380, probably largely a translation of Boccaccio's *Filostrato*, though Chaucer may have drawn directly from Benoît de Sainte-More's *Roman de Troyes* of the twelfth century, in which the episode is first introduced, or from Guido della Colonna's prose novel based on it.

TROYON, trwä'yôN', Constant (1810-65). A French landscape and animal painter of the Fontainebleau-Barbison school. He was born at Sèvres, August 25, 1810, and worked while a youth as a decorator in the porcelain factory, receiving meanwhile lessons in design from Riocruz and later from Poupart. At the age of twenty he began as a landscape painter by making studies in the fields. His first Salon pictures, exhibited in 1833, were mediocre in character. A fortunate acquaintance with the romanticist Roqueplan modified his style and brought him the acquaintance of Rousseau, and a closer association with Diaz and Dupré, his fellow-workers at the Sèvres factory. (See Barbison School.) Of great importance for his career was his visit, in 1847, to Holland, where his observation of the rich animal life of the fields, together with his study of Dutch art, gave a new direction to his own work. He found inspiration in Potter and Cuyp, and modified his technique after the example of Rembrandt. From 1848 he became distinctively an animal painter. His animals, however, were never detached studies, but an integral part of the landscape. Success and fortune came to him early; he received first class medals in 1846, 1852, and 1855, and the decoration of the Legion of Honor in 1849, after which orders multiplied rapidly and his rapidity of execution sometimes resulted in inferior workmanship. In consequence of overwork he lost his reason in 1863, and he died in Paris, February 21, 1865.

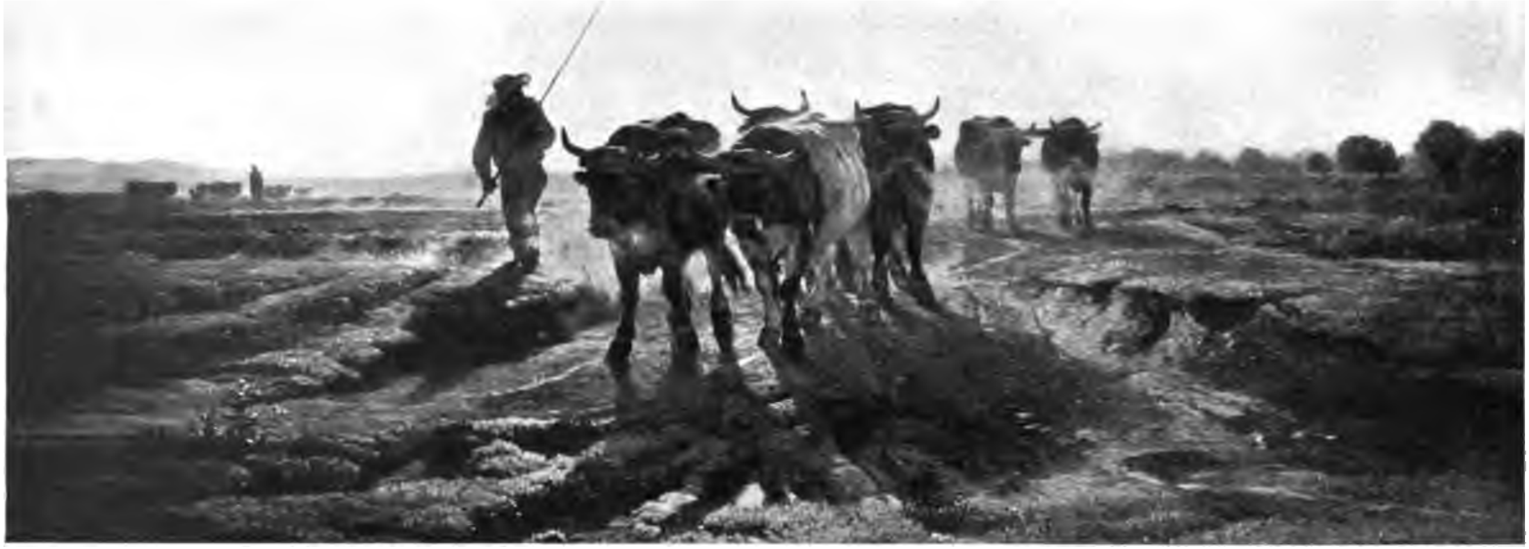
Troyon is the principal animal painter of the French school, the worthy compeer of Potter and Cuyp. No man has succeeded better in portraying the character of animals—the stolid indifference of the ox, the helplessness of the sheep. But more than any other cattle painter he is a consummate master of landscape, which he portrays with an epic simplicity equaled only by Rousseau. At first rather heavy, his execution speedily became broad and impressive; his poetic treatment of light and color is that of the Barbison school. His pictures often bear no distinctive names beyond the general designation of landscape and cattle. In the Louvre are "Return from the Farm" (1849) and "Oxen Going to Work in the Fields" (1855); other famous examples are "Valley of the Touques" (1853, Contesse Lehow), "Cart with Ass," "Sheep After Storm," "Cow Scratching Herself." There are good examples of his work in the provincial museums of France, and in the important private and public collections in the United States. Consult his biographies by Dumesnil (Paris, 1888); Hustin (ib., 1893); and Van Dyke, in *Modern French Masters* (New York, 1896).

TROY WEIGHT. See Weights and Measures.

TRÜBNER, trụb'nẽr, Nicholas (1817-1884). A London publisher, born in Heidelberg, Germany. After learning the bookseller's trade, he went to London in 1843, and was employed by the Longmans. In 1851 he entered into partnership with Thomas Delf, and soon became the head of the flourishing publishing house of Trübner & Co. One of his successful enterprises was a development of the American trade. In 1855 he published the admirable *Bibliographical Guide to American Literature*, which was greatly enlarged in 1859. He found time to study Sanskrit, Hebrew, and Basque, and wrote several learned books. He performed great services to scholarship by issuing works shunned by ordinary publishers. Two remarkable series of such works were *Trübner's Oriental Series* and the *British and Foreign Philosophical Library*. He was also the publisher of the Early English Text and other societies.

TRUCE (plur. of obsolete Eng. *true*, truce, true, AS. *trēowe*, *trywe*, Goth. *triggws*, Ger. *treu*, true; connected with OPruss. *druwis*, faith). In warfare, a truce closely resembles an armistice (q.v.), the two terms being frequently used as synonyms. Practically, the truce is a prelude to or the interval necessary to arrange for an armistice. In either case it is but a temporary cessation of hostilities, and may be merely local, arranged to afford safe conduct for the bearer of a message, or to permit the combatants to bury their dead; or, if general, to admit of peace pourparlers. International agreement as well as the unwritten law of the battlefield forbids either side taking advantage of a period of truce to improve their strategic advantage, by changes of position, disposition of troops, bringing up of reserves, or other reinforcements. A general truce is only made by the rulers or governments concerned, while a local truce may be arranged by the local commanders. During a truce a definite arrangement is made detailing the liberties permitted each combatant. It is understood, however, that each side is at liberty to carry out such operations as would have been possible during actual hostilities. Violation of a truce by either party, or any form of treachery regarding it, instantly terminates the truce. See Flag of Truce; War.

TRUCE OF GOD (ML. *treuga Dei*). In the Middle Ages private warfare was very common, and the Church synods, in order to limit what they could not wholly repress (see Peace of God), in the eleventh century and later, frequently passed decrees that there should be no such warfare during certain holy seasons and on certain days. The seasons during which peace was observed extended from Advent to Epiphany, and from Septuagesima to one week after Pentecost. In addition the time from Wednesday night to Monday morning of each week and all saints' days were included. By the end of the eleventh century only about eighty days in the year were left free for private warfare, but most of these days came in summer when the fighting would naturally be most common. These decrees of the councils, although frequently repeated, had little effect. Sometimes



TROYON
"OXEN GOING TO WORK," FROM THE PAINTING IN THE LOUVRE

the King, too, lent the truce the weight of his authority and thus made it a peace of the land. Consult: Kluckhohn, *Geschichte des Gottesfriedens* (Leipzig, 1857); Huberti, *Studien zum Gottesfrieden und Landfrieden* (Anspach, 1892).

TRUCK FARMING. See AGRICULTURE.

TRUDEAU, EDWARD LIVINGSTON (1848—). An American physician, born in New York City, who received his preliminary education in Columbia College, and his medical degree in 1871 from the College of Physicians and Surgeons, now Columbia medical department. After a brief period of practice in New York City, he was obliged by pulmonary disease in 1873 to go to the Adirondack Mountains, where he has since resided. In 1884 he founded the Adirondack Cottage Sanitarium at Saranac Lake, N. Y., for the treatment of incipient tuberculosis in working men and women, the first American institution attempting the climatic and open-air method of treatment of this disease. In 1894 he founded the Saranac Laboratory for the Study of Tuberculosis, the first research laboratory for the purpose in America. Dr. Trudeau is a member of many medical and other learned associations. He has contributed a vast number of articles to medical periodicals.

TRUE, ALFRED CHARLES (1853—). An American educator and agriculturist, born at Middletown, Conn. He graduated at Wesleyan University in 1873, was principal of the high school at Essex, N. Y., in 1873-74, from 1875 to 1882 was an instructor in the State Normal School at Westfield, Mass., and in 1882-84 studied at Harvard. In 1884-88 he was an instructor in the Wesleyan University, in 1888 entered the office of Experiment Stations in the United States Department of Agriculture (q.v.), was editor there in 1889-90, vice-director in 1891-92, and became director in 1893. He was dean of the first graduate school of agriculture held in the United States (at Columbus, Ohio, 1902), and as chairman of the committee on methods of teaching agriculture of the Association of American Agricultural Colleges and Experiment Stations, was for years prominent in the movement for the improvement of college courses in agriculture, and the extension of agricultural instruction to the elementary and secondary schools. He organized agricultural investigations in Alaska, Hawaii, and Porto Rico, and the work of the Department of Agriculture relating to irrigation, agricultural engineering, and the farmers' institutes. He particularly studied the organization and management of institutions for agricultural education and research, and published several monographs on this subject, chiefly in the bulletins of the office, including: *Education and Research in Agriculture in the United States* (1894); *Agricultural Experiment Stations: Their Objects and Work* (1895); *The Agricultural Experiment Stations in the United States* (with V. A. Clark, 1900); *Agricultural Experiment Stations in Foreign Countries* (with D. J. Crosby, 1902); and *Progress in Agricultural Education* (1902). For ten years he was chief editor of the *Experiment Station Record*. He contributed articles on agriculture and horticulture to the *New International Encyclopædia* and *Webster's International Dictionary*.

TRUE, CHARLES KITTREDGE (1809-79). A Methodist Episcopal clergyman. He was born in Portland, Maine; graduated at Harvard University, 1832, and entered the New England Conference, 1833. He was agent of the New England Education Society, 1834; principal of Amenia Seminary, 1835; entered the New York Conference, 1836; was transferred to the New England Conference, 1838; was professor of intellectual and moral science in Wesleyan University, Middletown, Conn., 1849-61; and financial agent of Wesleyan University, 1870-73. He published: *The Elements of Logic* (1840); *Shawmut; or, the Settlement of Boston by the Puritan Pilgrims* (1845); *John Winthrop and the Great Colony* (1875); *The Life and Times of Sir Walter Raleigh* (1877); *The Life and Times of John Knox* (1878); *Memoirs of John Howard* (1878); *The Thirty Years' War* (1878); *Heroes of Holland* (1882); *Life of Captain John Smith* (1882).

TRUEBA Y COSIO, trōō-ā'bȧ ē kō'sē-ō, TELESFORO DE (1798-1835). A Spanish and English author, born at Santander and educated in a Catholic college in England. His studies for a diplomatic career he made in London and in Paris, where he afterwards served as attaché to the Spanish legation until 1822. After his return to Spain he founded an academy uniting the entire younger generation of poets and presided over by Alberto Lista. The two comedies, *El veleta* and *Casarse con 60,000 duros*, which he wrote about this time, entitle him to be ranked with the best Spanish dramatists. In politics an ardent champion of the constitutional party, he took refuge in London on the restoration of the absolute régime and presently earned wide reputation as an English writer. Besides the novels *Gomez Arias* (1828) and *The Castilian* (1829), in imitation of Walter Scott, he published a *Life of Hernan Cortés* (1830); *History of the Conquest of Peru* (1830); *The Romance of History* (1830); *The Exquisites; Salvador de Guerilla; The Incognito* (1831); produced the comedies *Call Again To-Morrow* (1832), *The Exquisites, Mr. and Mrs. Pringle, The Man of Pleasure* (1832), and the historical drama *The Royal Fugitive* (1834); but won his greatest success with the descriptive picture of manners *Paris and London* (1831). Returning to Spain in 1834, he was elected to the Cortes and secretary of the Second Chamber. He died in Paris.

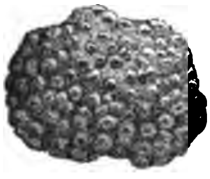
TRUEBA Y LA QUINTANA, ē lȧ kēn-tä'nȧ, ANTONIO DE (1821-89). A Spanish poet and novelist, born in the Basque region, of peasant stock. He went to Madrid, where he entered business, but devoted his leisure hours to study, and even succeeded in obtaining a university degree. He was made by Isabella II. historiographer of Biscay, but was deprived of his post of historiographer when the Queen was banished in 1868. His verse, contained in the two collections *El libro de los cantares* (1852) and *El libro de las montañas* (1868), is marked throughout by a tender melancholy natural to his native Basque region, of which he sings. His historical novels, such as *El Cid Campeador* and *Las hijas del Cid*, are dreary performances. In the short tale of manners, descriptive of his beloved Basque district, he succeeded. There are various collections of these tales, for example, the *Cuentos de color de rosa*, the *Cuentos cam-*

pesinos, the *Cuentos de varios colores*, the *Narraciones populares*, the *Cuentos de madres é hijos*.

TRUE BILL. See INDICTMENT.

TRUE INSPIRATION CONGREGATION. See COMMUNISTIC SOCIETIES.

TRUFFLE (OF. *trufle*, *trufe*, *truffe*, Fr. *truffe*, truffle, perhaps from Lat. *tubera*, neu. pl., but taken as fem. sg. of *tuber*, swelling, tumor, tuber), *Tuber*. A genus of ascomycetous fungi of the order Tuberales; globose, or nearly so, of a fleshy substance, with a distinct skin, the whole substance pervaded by a network of serpentine threads (*hymenium*) which bear the spore-cases in minute cavities. The species, which are not numerous, are very generally diffused in temperate parts of the world; they are subterranean, found frequently in groups of 10 to 20 individuals a foot or more below the surface soil. Some of them are among the most highly valued of esculent fungi. The common truffle (*Tuber cibarium*) is black, and has a roughened surface. Its size varies from that of a large plum to a large potato. On account of its agreeable flavor, it is used in the preparation of many dishes. It is common in the central and southern parts of Europe, chiefly in loose soils, in woods and pastures, as in the pine, oak, and chestnut woods of France and Italy. Other species, as *Tuber æstivum*, *Tuber rubum*, and *Tuber melanosporum*, are found in some parts of France, Italy, and other countries of Europe, and are sought and used in the same manner as the common truffle. Dogs and pigs are trained to seek them, and readily discover by the scent the spot where they grow under ground. The stirring of the soil in the gathering of truffles seems to increase productiveness. White truffles (*Terfezia leonis*), a species of a nearly allied genus, which has also been found in many places, grows half above ground, is pinkish, and is generally as large as a walnut. It is less aromatic than the common truffle, but is used in the same way. As yet edible species are little known in the United States.



TRUFFLE.

TRUJILLO, tro͞o-hēl′yô (formerly TRUXILLO, from Lat. *Turris Julii*). A town of the Province of Cáceres, Spain, in Estremadura, 24 miles east of the city of Cáceres on the main highway from Madrid to Portugal (Map: Spain, C 3). The surrounding country is mountainous, but produces wheat, wines, oil, and fruits; live stock is raised. The principal manufactures are chocolate, leather goods, pottery, and delft-ware. There are valuable forests in the vicinity. The town contains many convents and churches, of which the most famous is that of Santa Maria de la Concepción, which holds the tomb of Francisco Pizarro (q.v.). The so-called 'Tower of Julius' and other Roman ruins are found in the vicinity. The population of the ayuntamiento in 1900 was 9304.

TRUJILLO, or **TRUXILLO.** A seaport of Honduras, on the Atlantic coast, Bay of Truxillo, 137 miles northeast of Tegucigalpa (Map: Central America, E 3). The town was formerly the most important port of Northern Honduras. In recent years much of its trade has been diverted. Population, about 4000. Trujillo was founded in 1523 and was formerly the capital of the Republic. Here the celebrated American filibuster Walker was captured and executed in 1858.

TRUJILLO, or **TRUXILLO.** A Peruvian city, capital of the Province of Libertad (formerly the Intendencia of Trujillo), situated near the mouth of the river Moche, 320 miles northwest of Callao, and connected by rail with its port, Salaverry (Map: Peru, B 5). The town is still surrounded by walls of the seventeenth century. It contains a cathedral, a university, and a theological seminary. It was formerly an important commercial centre, but, as its port is an open roadstead, its trade is now restricted largely to the province. Near it lie the ruins of the Inca city Gran Chimu. Trujillo was founded by Pizarro in 1535, and named in honor of his birthplace. It was destroyed by an earthquake in 1619. Its population in 1900 was about 8000.

TRUL′LIBER, PARSON. A fat and brutal curate, the antithesis of Parson Adams, in Fielding's *Joseph Andrews*.

TRUM′BULL, BENJAMIN (1735-1820). An American clergyman and historian, born at Hebron, Conn. He graduated at Yale in 1759, and was pastor of the Congregational Church at North Haven, Conn., from 1760 until his death. He served in the Revolutionary Army as chaplain and as volunteer soldier. He published: *Twelve Discourses on the Divine Origin of the Holy Scriptures* (Hartford, 1790); *General History of the United States of America* (Boston, 1765-1810); and a painstaking and excellent *History of Connecticut from 1630 till 1713* (Hartford, 1797).

TRUMBULL, HENRY CLAY (1830-1903). An American clergyman and author, born at Stonington, Conn., and educated at Williston Seminary, at Yale, and at the University of New York. He was ordained a Congregational minister, served as chaplain of the Tenth Connecticut Regiment in 1862-65, and was in several Confederate prisons. In 1875 he became editor of the *Sunday School Times*. His publications include: *The Knightly Soldier* (1865); *Kadish-Barnea* (1883); *Teaching and Teachers* (1884); *Principles and Practice* (6 vols. 1889); *Studies in Oriental Social Life* (1894); *War Memories of an Army Chaplain* (1898); and *Old-Time Student Volunteers* (1902).

TRUMBULL, JAMES HAMMOND (1821-97). An eminent American philologist, born in Stonington, Conn., and educated at Yale. Feeble health prevented the completion of his college work as well as his entering upon active professional life. After 1847 he was a resident of Hartford. From 1847 to 1852 and again from 1858 to 1861 he was Assistant Secretary of State, and from 1861 to 1865 was Secretary of State, of Connecticut. He was among the foremost of American philologists, and was a well-known writer on historical subjects of local interest. He also made a thorough study of the Indian tongues, and prepared a glossary of Eliot's Indian Bible. He was the State librarian in 1854-56, and from 1863 until his death was librarian of the Watkinson Library of Hartford;

from 1849 to 1863 was secretary of the Connecticut Historical Society, and was its president from 1863 until his death. He was one of the editors of the *Colonial Records of Connecticut* (15 vols., 1850-90); he also edited the *Memorial History of Hartford County* (1886); and he prepared an edition of T. Lechford's *Plain Dealing* (1867), and of Roger Williams's *Key into the Indian Language* (1866). His own publications include: *The Composition of Indian Geographical Names* (1870); *The Best Method of Studying the Indian Languages* (1871); *Historical Notes on the Constitution of Connecticut* (1872); *The True Blue Laws of Connecticut, and the False Blue Laws Invented by Rev. Samuel Peters* (1876); and *Indian Names of Places in and on the Borders of Connecticut, with Interpretations* (1881). He also wrote numerous articles in his particular fields of study, and also secured further recognition as a bibliographer by preparing the catalogue of George Brinley's library (1878-97).

TRUMBULL, John (1750-1831). An Ameriican judge and poet, born in Watertown, Conn. Precocious in childhood, he passed his examinations for Yale at the age of seven, but spent six further years in preparatory study, and was not graduated until 1767. Two years later he wrote essays in imitation of Addison for local journals. In 1771 he became tutor at Yale, studied law, and was admitted to the bar in 1773, having already signalized his satiric powers in *The Progress of Dullness* (1772). To this he added a second and third part in 1773, and in that year entered the law office of John Adams in Boston. At New Haven in 1774 he composed the first portion of his most famous satire, *McFingal*, a mock epic after the fashion of *Hudibras*. During the Revolutionary War he lived in Westbury and Hartford, where he completed *McFingal* (1782). This work became very popular, no less than thirty pirated editions being known to collectors. From it is taken the familiar quotation "A thief ne'er felt the halter draw With good opinion of the law." His political writing after the Revolution was Federalist in spirit and a protest against anarchical tendencies. His poetical works were collected in 1820. He coöperated with the famous Hartford Wits in the *Anarchiad*, and was State Attorney (1789), legislator (1792, 1800), and Superior Court judge from 1801 to 1819, when he moved to Detroit, where he died. *McFingal*, which may be best read in the edition of B. J. Lossing (1860), is a vigorous production, and, though lacking in sprightliness, is one of the few Revolutionary poems worth a glance to-day.

TRUMBULL, John (1756-1843). An American historical and portrait painter. The son of Jonathan Trumbull, Governor of Connecticut, he was born at Lebanon, Conn., June 6, 1756, graduated at Harvard in 1773, and two years later entered the Continental Army. Having made for Washington a plan of the British works before Boston Neck, he was appointed an aide-de-camp, and the following year a deputy adjutant-general under Gates. He retired from the army in 1777, but in 1778 he took part as a volunteer in General Sullivan's expedition to Rhode Island; and in 1780 he became a pupil of Benjamin West, in London. The news of André's execution fastened upon him the suspicion of being a spy, and he was imprisoned for eight months. In 1782 he returned to America and remained until the Peace of Paris had been signed, when he went back to London to continue his studies. In 1784 he went to Paris, where, in consultation with Thomas Jefferson, he painted his first historical picture, "The Signing of the Declaration of Independence." This picture and those of the "Surrender of Burgoyne," "Surrender of Cornwallis," "Resignation of Washington at Annapolis," hang in the Capitol at Washington. Most of his pictures are at the Art Gallery of Yale College, to which he presented them in return for an annuity of $1000. Among the principal are the "Battle of Bunker Hill" (1786); "Death of Montgomery" (1781); "Battle of Princeton," "Battle of Trenton," and portraits of Washington, Hamilton, the Duke of Wellington, and others. Other well-known portraits by him are those of Washington, George Clinton, John Jay, and Alexander Hamilton, in the New York City Hall; of General and Mrs. Washington in the National Museum, Washington; of John Adams, of his father, Jonathan Trumbull, and of Rufus King. Although not of the highest rank, his work is good in composition and color, and is pervaded by a healthy realism. In 1794 he served under Jay as secretary of legation in England; and from 1816 to 1825 was president of the Academy of Fine Arts, New York, in which city he died, November 10, 1843. Consult his *Autobiography* (New York, 1841); Durand, in *American Art Review* (1881).

TRUMBULL, Jonathan (1710-85). An American patriot and political leader, born at Lebanon, Conn. He graduated at Harvard in 1727, studied for the ministry, and for a time held a pastorate at Colchester, Conn., but in 1731 joined his father in mercantile pursuits. Meanwhile he began the study of law, and in 1733 was sent to the General Assembly, of which he became Speaker in 1739. In 1740 he was appointed Governor's assistant, in which position he was retained for many years; and from 1766 to 1769 he was Deputy Governor, and as such the *ex-officio* Chief Justice of the Superior Court of Connecticut. From 1769 to 1783 he was Governor, and at the outbreak of the Revolutionary War was the only one of the colonial Governors who gave his unqualified support to the Patriot Party. At the close of the war he was prominent as an advocate of a strong federal government. According to a long accepted tradition he was called by Washington 'Brother Jonathan,' a phrase which later came into general use to personify the United States. See National Nicknames.

TRUMBULL, Jonathan (1740-1809). An American political leader, the son of Jonathan Trumbull (1710-85), born at Lebanon, Conn. He graduated at Harvard, 1759; was for several years in the State Legislature; was paymaster-general of the Northern Department from July, 1775, to July, 1778; and was military secretary to General Washington, with the rank of lieutenant-colonel, in 1781-83. He was a Federalist member of Congress from 1789 to 1795, being Speaker of the House in 1791-95; was a member of the United States Senate in 1795-96; was

Lieutenant-Governor of Connecticut in 1796-98; and was Governor from 1798 to 1809.

TRUMBULL, Joseph (1782-1861). An American lawyer, grandson of Jonathan Trumbull (1710-85). He was born at Lebanon, Conn. After graduating at Yale in 1801, he studied law and from 1804 to 1828 practiced at Hartford. In the latter year he became president of the Hartford bank. He was a member of the Legislature from 1832 to 1848, and in 1851. In 1834-35, on appointment, he served in Congress as a Whig, and again in 1839-43 was a member of that body. In 1849-50 he was Governor of Connecticut. He was actively interested in public internal improvements and in educational matters.

TRUMBULL, Lyman (1813-96). An American jurist and politician, born at Colchester, Conn. He received an academic education, taught school in Georgia, and was admitted to the bar in 1837. He removed to Belleville, Ill., and in 1840 was elected to the Legislature as a Democrat. In 1841-42 he was Secretary of State, and from 1848-53 was a justice of the Supreme Court. From 1855 to 1873 he was a member of the United States Senate. When the slavery question became acute he joined the Republican Party, was chairman of the Judiciary Committee after 1861, supported the Emancipation Proclamation, and the suspension of *habeas corpus*, and drafted the Thirteenth Amendment to the United States Constitution. After the war he was one of the five Republican Senators who refused to vote for the impeachment of President Johnson, and thereafter acted with the Democrats. In 1873 he returned to the practice of law in Chicago. In 1880 he was the unsuccessful Democratic candidate for Governor of Illinois. He joined the Populists in 1894, and defended the leaders of the great railway strike in Chicago in that year.

TRUMPET (OF., Fr. *trompette*, It. *trombetta*, trumpet, diminutive of Fr., OF. *trompe*, It. *tromba*, trumpet, probably from OHG. *trumba, trumpa*, Ger. *Trommel*, drum, perhaps corrupted from Lat. *triumphus*, triumph; ultimately connected with Eng. *drum*). A musical instrument of great antiquity, which, in its present form, consists of a tube 8 feet long, less in diameter than the horn, doubled up in the form of a parabola, and sounded by a mouthpiece. By means of crooks the instrument can be adjusted to any degree of the chromatic scale. With the exception of the one in C, all trumpets are transposing instruments. The music is always written in the treble clef. The sound is bright and penetrating. The older composers, including Beethoven, had to be very careful in the selection of the trumpets for a particular composition, and even then it was not always possible to have the trumpet play all the notes desired. To remedy this serious defect the instruments were provided with valves, enabling them to produce all chromatic intervals from g to g^3.

TRUMPET CALLS. See Bugle and Trumpet Calls.

TRUMPETER (so called from its note), or Agami. One of the birds of the family Psophiidæ, allied to the cranes, and natives of South America. They have the plumage of the head and neck short and velvety, while that of the rump is long and loose, and possesses the remarkable character of having a series of sub-orbital bones as in reptiles. The best known species is *Psophia crepitans*, which occurs in large flocks north of the Amazon, especially in the forests of British Guiana. These birds, of which several species exist, have little power of flight. The flesh is palatable, and they are domesticated by the Indians. Another species (*Psophia leucoptera*) is termed 'corcosoda.' See Plate of Cranes, etc.

TRUMPETER BEE. The member of a colony of bumblebees whose office it seems to be to arouse the denizens of a nest to work in the early morning.

TRUMPETER-FISH. The most important of the commercial food-fishes of New Zealand, *Latris necatia*, often reaching a weight of 50 pounds. It is a member of the 'long-fin' family Cirrhitidæ, related to the sea-breams (Sparidæ), which furnishes many valuable food-fishes throughout the Indo-Pacific region. One species (*Chilodactylus macropterus*) is highly prized both at the Cape of Good Hope and in Australia, and reaches a weight of 25 pounds. These fishes are called 'long-fins' on account of a prolongation of one of the rays of the pectoral fins.

TRUMPETER HORNBILL. See Hornbill.

TRUMPET-FISH. See Snipefish.

TRUMPET FLOWER (so called from the shape of the flower). The popular name of the genus Tecoma (natural order Bignoniaceæ), comprising about twenty-four species of Asiatic, Australian, African, and North American mostly climbing and twining shrubs without tendrils, producing large flowers with a long tubular corolla which suggested the common name. The trumpet creeper, or trumpet vine (*Tecoma radicans*), is a beautiful North American hardy species which climbs by means of aërial rootlets and has large attractive funnel-shaped orange-yellow and scarlet flowers. *Tecoma australis* is an ornamental Australian climber. *Tecoma jasminoides*, another Australian species, is grown in greenhouses. *Tecoma capensis* is a South

TRUMPET-CREEPER (*Tecoma radicans*).

African climbing shrub with clustered racemes of orange-scarlet flowers. *Tecoma grandiflora*, a rather tender Chinese and Japanese species, is in common cultivation. *Tecoma stans*, a yellow flowered Texan species, is an erect shrub. The plants are propagated by seeds, layers, cuttings of well-developed shoots, and most commonly by root cuttings. Species of the closely related genus Bignonia are sometimes also called trumpet flower.

TRUNK-BACK TURTLE. The leatherback (q.v.).

TRUNKFISH (so called from its incasement, which resembles a trunk), or BOXFISH. A fish of the order Ostracodermi, and family Ostraciidæ, with a short, cuboid body, covered by a carapace formed of firmly united polygonal bony scutes, the jaws, bases of the fins, and caudal peduncle free and covered by smooth skin. They swim by means of a curious sculling motion of the small dorsal fins and anal fins, the tail acting as a rudder, while the pectoral fins fan water into the gills. There are about twenty species, all of tropical seas, and dwelling near the bottom, feeding on minute animals. The common trunkfishes, such as the West Indian *Lactophrys trigonus*, have the carapace or 'box' three-angled. A somewhat different one (*Lactophrys tricornis*) is the 'cowfish' or 'toro' of Florida and Cuba, and distinguished by the stout spines that form three 'horns' on the head. It ranges to the Cape of Good Hope, reaches 18 inches in length, and makes good food when baked in its shell. See Plate of PLECTOGNATH FISHES.

TRUN'NION, COMMODORE. In Smollett's *Peregrine Pickle*, a retired sailor, the eccentric uncle of the title character. His household is arranged on naval lines and subjected to the discipline of a ship.

TRU'RO. A seaport in Cornwall, England, eight miles north of Falmouth, at the junction of the Allen and the Kenwyn with an inlet of the sea called the Truro River (Map: England, A 6). Truro is the centre of a mining district, and exports tin and copper ore. Its cathedral, an Early English structure in granite, consecrated in 1887, ingeniously incorporates portions of Saint Mary's Church, a Perpendicular edifice of the reign of Henry VII. The grammar school dates from 1546. Anciently called Truera and Truruburgh, Truro was the sea of the Stannery Parliaments of Cornwall, and was a privileged tin coinage town. Population, in 1901, 11,562.

TRURO, THOMAS WILDE, Baron (1782-1855). An English jurist and Lord Chancellor. He was born in London, was educated at Saint Paul's School, and was trained as a lawyer. In 1805 he was admitted as attorney and for some years practiced as such, but in 1817 was called to the bar as barrister, and in 1820 made himself celebrated by his defense of Queen Caroline. In 1831 he entered Parliament and gradually won for himself as great distinction there as he had won in the courts. In 1839 he became Solicitor-General, and in 1841 became Attorney-General, but held the office only a few months. In 1843 he introduced Rowland Hill's plan for postal reforms in the House of Commons, in 1846 was again made Attorney-General on the resumption of office by Lord John Russell, and a few days later was appointed Chief Justice of the Court of Common Pleas. In 1850 he was made Lord Chancellor and created Baron Truro of Bowes, but was relieved by the fall of the Government in 1852.

TRUSS (OF., Fr. *trousse*, from *trousser*, to pack, bind, tie, It. *torciare*, to twist, wrap, tie, from Lat. *tortus*, p. p. of *torquere*, to twist). An instrument employed in the palliative treatment of hernia, with the view of preventing its descent, and in some cases of effecting a permanent cure. It consists essentially of a pad or cushion attached to a metallic spring, with straps so arranged that its position may be retained during the varied positions of the body. The necessity of having recourse to a suitable truss the moment that the slightest protrusion shows itself in any of the parts liable to hernia cannot be too strongly urged. Many varieties of trusses have been devised. The choice of the instrument required in any particular case should be left to the surgeon. See HERNIA.

TRUST (ME. *trust, trost, trist, tryst*, Goth. *trausti*, covenant, treaty, OHG. *trōst*, Ger. *Trost*, trust, protection; connected with Eng. *true*, OPruss. *druwis*, faith, *druwīt*, to believe). In its broadest sense, a legal relation existing between two or more persons such that a court of equity will compel one to hold property or an interest in property of which he has the legal title for the benefit of the other or others. The person so holding the legal interest in property is called the *trustee*, and the person entitled to the benefit, or, as is sometimes said, the 'equitable interest' in the property, is known as the *beneficiary* of the trust, or the *cestui que trust*. The *fideicommissum* (q.v.) of the Roman law, which was a form of trust created by will, has been supposed to have been the model of uses, the early form of trust introduced into England by the clergy as a means of avoiding the operation of the mortmain statutes (q.v.). Another analogy has been found in the Roman idea of *usufructus*, or the right of temporary enjoyment of a thing as distinct from the legal ownership of it. The analogy, however, between uses or trusts on the one hand, and the *fideicommissum* and the *usufructus* on the other, fails in many important particulars, and it seems most probable that the use is an independent product of English jurisprudence, although its development was greatly aided by the doctrines of the Roman law with which the clergy were familiar.

The practice of conveying land to uses, that is, the granting of land to one to be held by him for the benefit of another, seems to have existed as early as the reign of Edward III. Such grants were made by debtors to avoid levy of execution by creditors, and by disseisors to avoid the claims of rightful owners of the land. By thus conveying land to another to the use of the grantor, the grantor retained all the benefits of a purely legal ownership, while he divested himself of all its burdens. First, the obligation of the grantee to uses to hold the land to the use of his grantor seems to have had only a moral or religious sanction, and, resting as it did upon conscience and good faith, was a proper subject for the then rapidly growing jurisdiction of the Court of Chancery. (See CHANCERY.) There is some evidence that the Chancellor took jurisdiction to enforce such obligations upon equitable grounds in the reign of Richard II., and the jurisdiction became well established during the reigns of Henry VI. and Edward IV. By virtue of the Chancellor's power to command things to be done, he could compel the feoffee to uses to carry out fully the equitable obligation imposed upon him by the grantor, and in the reign of Edward IV. we find the Chancellor imposing the same obligations upon those who acquired the legal title from the feoffee by inheritance or by purchase, if the purchaser had notice of the claim of the *cestui que use.* Equity also came to recognize the right or interest of the *cestui* as analogous to a legal interest in the land which might be freely conveyed or assigned and which might be inherited. Thus, in addition to the power of the legal owner of land to divest himself of the burdens of legal ownership by the conveyance to uses, he was also enabled to grant the use in ways not permitted at common law, as, for example, the grant of the use of property by the husband to his wife.

At this period (Edward IV.) there were three recognized methods of creating a use or trust in lands: (1) *By feoffment* or *transmutation of possession,* as already mentioned. Analogous to this was the practice of enfeoffing another to the uses to be declared in the feoffor's will. Equity in such cases compelled the feoffor or trustee to hold the property for the benefit of those named in the feoffor's will. (2) *By bargain and sale.* When the legal owner entered into a legal contract for the sale of land in which the buyer paid, or agreed to pay, the vendee for the land, a court of equity treated the vendor as a trustee and compelled him to hold the land for the use or benefit of the buyer. (3) *By covenant to stand seized.* This was a covenant by which the legal owner of land covenanted to stand seized or possessed of the land to the use or for the benefit of a blood relative. Courts of equity treated such an instrument as a valid declaration of trust, enforceable against the covenantor for the benefit of the relative named in the covenant.

The use of the trust as a means of evading the obligation of legal ownership led to the enactment of the Statute of Uses, 27 Henry VIII., cap. 10. Its purpose was to abolish the practice of creating uses or trusts of land, and its effect was to declare that, by operation of law, the legal title should be deemed vested in the beneficiary or *cestui que use.* Upon its face the statute was effectual to serve this purpose, and its immediate effect was to permit the creation and transfer of legal estates in the same manner as uses or equitable estates had been created and transferred before the statute, and incidentally to permit the conveyance of a legal interest in land by mere deed of bargain and sale without feoffment as at common law. (See CONVEYANCE; USES.) Influenced, however, by the same powerful motives which were responsible for the development of the system of uses, the early lawyers, by a method of reasoning now difficult to understand, ultimately gave to the statute a meaning and effect the exact opposite of that intended. It was held that when land was granted to A for the use of B, the efficiency of the statute to vest the grantee to uses with the legal title was exhausted, so that if the grant was made to A for the use of B for the use of C, then B, who acquired the legal title by operation of the statute, would hold it for the benefit of C. It was also held that when an active duty was imposed upon the grantee to uses or trustee, as by a grant of real estate to A to collect and pay over the rents to B, the use was not executed by the statute by making B the legal owner, but was enforceable by Chancery as before the statute. The result, therefore, was that the system of trusts was preserved and its development stimulated rather than hindered by the statute. In both England and the United States there is a complete system of trusts of both real and personal property, either as developed by courts of equity or modified by statutes.

In order to create a trust all that is now necessary is that one should convey or grant, either by will or by grant *inter vivos,* specific property to one in trust for another, or that one having the legal title to such property should declare that he holds it in trust for another. No consideration is necessary to create a trust, and no writing or other formal document is required, except that trusts of real estate are required by the Statutes of Frauds to be evidenced by writing. No particular words are necessary, but the intention of the person creating the trust must be clear. Any legal person or a corporation if within its corporate powers may become a trustee. Formerly the legal title held by the trustee, according as it was real or personal property, passed upon his death to his heirs or next of kin, whom equity would compel to hold the property for the benefit of the beneficiaries under the trust, but generally by modern statutes provision is made in case of the death or misconduct of a trustee for the appointment by the court of a new trustee, who acquires the title of the first trustee. Any legal person may be a *cestui que trust,* but it has been held upon somewhat unsatisfactory reasoning that trusts for the benefit of unascertained beneficiaries or for the benefit of inanimate objects were invalid, even though the trustee was able and willing to carry out the trust. In general, also, all the rules governing and determining the illegality of agreements are applied by courts of equity in determining the validity of trusts.

Trusts have been classified with reference to the manner of their creation as Express, Implied, Resulting, and Constructive. (1) The express trust is one created by the intent of the person creating or declaring the trust, expressed in written or spoken language, such as the trust created by express clauses in a will or by a formal declaration of trust. (2) The term 'implied trusts,' which has been sometimes applied to constructive trusts, denotes trusts created by the intent of the person creating or declaring it, when his conduct or language, either written or spoken, is such that the court infers or implies the intention to create the trust. (3) Resulting trusts are trusts which are not created as a consequence of actual intention, but which courts of equity in certain instances treat as trusts intended to be created. As it is said, under certain circumstances, the intention to create a trust is presumed. Thus, if the purchaser of real estate pays the purchase price, but takes the title in the name of a third person, the courts of equity hold that a resulting trust is created in favor of the purchaser, or when one conveys property to a trustee upon a trust which fails or is illegal, a resulting trust is deemed to be created in favor of the grantor, and in many cases when voluntary conveyances or conveyances without consideration are made a resulting trust is implied in favor of the grantor. (4) Constructive trusts include all those cases not included in the preceding classes in which courts of equity upon some equitable ground will compel the person having the legal title or interest in property to hold it for the benefit of another. Like resulting trusts, they differ from express and implied trusts in that they are not created as a consequence of intention of the interested parties. Thus, whenever the legal title of property has been wrongfully acquired by fraud, the person guilty of the fraud, or any person claiming under him who is not a bona-fide purchaser of the property for value, will be treated as a trustee and compelled to turn the property over to the person defrauded who is a constructive *cestui que trust*. Equity acts in a similar manner in enforcing equitable liens (q.v.) by compelling the lienee to hold the property subject to the claim of the lienor.

The so-called doctrine of tracing trust funds is a special application of the doctrine of constructive trusts. Not only will equity follow property acquired by fraud or breach of trust into the hands of any person who is not a purchaser in good faith for value, but it may compel any such constructive trustee who has disposed of the property to account for its proceeds in his hands, even though the proceeds have in time been converted into other property. As neither resulting nor constructive trusts are created by intention of the interested parties, neither is within the Statute of Frauds requiring the trust to be evidenced by writing. The trustee is, strictly speaking, the legal owner of the property, with all the rights and obligations of legal ownership, subject only to the right of the *cestui que trust* to compel with the aid of a court of equity performance of the trust. The trustee may sue and be sued with reference to the trust property without joining the *cestui que trust*. He may convey it, giving a complete legal title, although he may act in violation of the trust. With reference to the *cestui que trust*, however, he must perform completely the terms of the trust, and he cannot delegate his authority. He must act in good faith and with due care in administering his trust, and for failure to do this he must account to his *cestui*. When he has funds in hand he must keep them properly invested. In many States the investments which a trustee may make are regulated by statute or by settled practice. Aside from his fees allowed by law or specifically granted by the terms of the trust, he cannot make any gain or profit from his position as trustee. In several of the United States, notably in New York, statutes have been passed defining and generally regulating trusts and attempting to some extent to limit the doctrine of trusts as developed by the English Court of Chancery. It may be said, however, that neither by legislation nor otherwise has there been any material modification of the notion of a legal interest vested in one person and held by him for the benefit of another, the obligation to so hold the property being enforced by courts having equity powers. More changes have been made in the direction of substituting one trustee for another with facility in case of death or misconduct of a trustee, and in providing for the accounting of trustees and regulating their acts. Breach of trust or misappropriation of trust funds was not a crime at common law. It is now generally made a crime, being punishable as one of the statutory forms of embezzlement. In New York misappropriation of trust funds falls within the statutory definition of larceny and is punishable as such.

Consult the statutes of the various States; also the works on the law of trusts and trustees by Lewin (10th ed., London, 1899); Romer (London, 1898); Robbins and Maw (3d ed., London, 1901); and also the authorities referred to under EQUITY. See CHANCERY; EQUITY; FRAUD; FIDUCIARY.

TRUST, CHARITABLE. See CHARITABLE TRUSTS.

TRUST COMPANIES. Institutions chartered by the several States of the United States for the purpose of performing, as corporations, the general acts and assuming the general responsibilities imposed upon individuals under the law of trusts. The trust company in the United States exists in various forms, and combines with its trustee business numerous other lines of banking; as, for instance, the private savings bank business in certain States, chiefly in the West; mortgage investment in nearly all States; title guarantee and other insurance; and of recent years a general banking business similar in all respects to that of the ordinary deposit bank.

The growth and extension of trust companies in the United States has been one of the most noteworthy incidents in the country's recent financial history. The Comptroller of the Currency, in his annual report summarizing the various banking institutions in the United States, had returns in 1898 from 246 institutions of this class, which number had at the close of 1902 risen to 417. In 1902, according to the same report, the assets of the 417 companies aggregated $1,983,214,707. On January 1, 1899, there had been incorporated in New York State 49 trust companies, having aggregate resources of $579,205,442. At the opening of 1903 there were 77 institutions in existence, with total assets of $1,039,956,625. On January 1, 1898, the deposits of the New York trust companies aggregated $383,328,724. At the opening of 1903 their total was $734,342,837. The loan account, which amounted at the opening of 1898 to $261,765,000, had risen at the opening of 1903 to $597,194,389. At the opening of 1898 investments by trust companies in stocks aggregated in New York State $113,525,797; at the opening of 1903 they had very nearly doubled, rising to $219,378,946.

The trust companies have occupied public interest and discussion chiefly because of the exceptional increase of deposits since 1896-97, which is a result partly of the general practice maintained by these companies of offering interest on deposit accounts—a practice very generally abandoned nowadays by banks in the larger cities. The trust companies in New York City offer interest on all deposits at a rate varying from 2 to 4 per cent., according to the agreement made as to the permanency of the deposit. In addition to the large amount of deposits thus attracted, the immense credit fund in the hands of the trust companies for loaning purposes has made possible the increase of their deposits, through the making of such loans, at a far more rapid rate than heretofore.

Public discussion has converged on these operations, not only because of their magnitude, but because banking deposits maintained by the trust companies have not been guarded in the same way as have those of the banks. In general, there is no restriction in the State laws as to the amount of cash reserve which a trust company must keep against its deposits, the presumption of the law being that trustee business pure and simple was being carried on. The question whether this position was altogether safe from a banking standpoint has been debated with considerable energy, and various reforms or remedies have been suggested. In the making of such reforms, whether through private arrangement or through legislative act, two difficulties arise, due to differences either in the character or practices between the trust companies and the banks. First, the trust companies, though keeping on hand a cash reserve amounting at times to barely 2 per cent. of their deposit funds, nevertheless maintain on deposit at demand in other institutions an amount bearing a much larger proportion to their own deposit liabilities. On such deposits with other institutions trust companies usually draw 2 per cent. interest. The magnitude of these deposits may be shown from the New York trust company returns of January 1, 1903. As against their own deposit liabilities of $734,342,837, they then had on hand in cash only $10,493,236, but reported also as on deposit with other banks to their credit $128,166,652. The second difficulty in the way of arbitrary regulation of the trust company reserve fund lies in the fact that not all trust companies do a general banking business, some of them restricting their activities to trustee business of the old-fashioned order. In general, it has been recognized that deposit accounts held in a trustee business as originally contemplated need no more than a nominal cash reserve.

The trust companies of New York State may be taken as typical in a study of the problem. The important point to notice in these companies is that the law which created them is acknowledged not to have contemplated the doing of business on precisely the lines now followed by many of the institutions. Seventeen trust companies in New York State were chartered by special act of the Legislature between 1822 and 1887. In the latter year the general trust company law was passed, which, as subsequently amended, is now the basis of authorization for the business of the 60 subsequently incorporated companies. The purpose of the law, as clearly shown in these various enactments, was to create a class of institutions which in their powers, duties, and responsibilities should be able to act as substitute for the individual trustee. The general trust company law of New York State as it now stands authorizes the companies to perform the following functions: (1) To act as the fiscal or transfer agent of any State, municipality, body politic, or corporation, etc. (2) To receive deposits of trust moneys, securities, and other personal property from any person or corporation, and to loan money on real or personal securities. (3) To lease, hold, purchase, and convey any and all real property necessary in the transaction of its business, or which the purposes of the corporation may require, or which it shall acquire in satisfaction or partial satisfaction of debts. (4) To act as trustee under any mortgage bond issued by any municipality, body politic, or corporation. (5) To accept trusts from and execute trusts for married women, in respect to their separate property, and to be their agent in the management of such property. (6) To act under the order or appointment of any court of record as guardian, receiver, or trustee of the estate of minors. (7) To take, accept, and execute any and all such legal trusts, duties, and powers in regard to the holding, management, and disposition of any estate, real or personal, and the rents and profits thereof, or the sale thereof, as may be granted or confided to it by any court of record, or by any person, corporation, municipality, or other authority. (8) To take, accept, and execute any and all such trusts and powers of whatever nature or description as may be conferred upon or intrusted or committed to it by any person or persons, or any body politic, corporation, or other authority. (9) To purchase, invest in, and sell stocks, bills of exchange, bonds and mortgages, and other securities. (10) To be appointed and to accept the appointment of executor or of trustee under the last will and testament, or administrator with or without the will annexed, of the estate of any deceased person, and to be appointed and to act as the committee of the estates of lunatics, idiots, persons of unsound mind, and habitual drunkards.

These functions make plain both the nature of the trust company's business as contemplated by the legislators, and its difference from the banking business as conducted by an ordinary deposit bank. It will be observed that the act above quoted does not specifically in any place authorize the trust company to transact a general deposit banking business. But the statute does not deny such powers, and in section 8 it provides that a company incorporated under the act may accept "any and all such trusts and powers, of whatever nature or description, as may be conferred upon or intrusted or committed to it by any person or persons." This is a sufficiently sweeping proviso to cover the doing of banking business in any deposits intrusted to the company by individuals, and on that basis a great part of the trust company business as nowadays understood has been built up.

It is because of this growth of a business not contemplated in the original authorizing act that the most interesting recent controversy over the trust company business has grown up. In New York State, trust companies which report semi-annually to the State Banking Department showed in 1898 'deposits in trust' of $185,099,694; at the opening of 1903 their 'deposits in trust,' which still should have referred to deposits under the strict purpose of the original act, were given as $205,341,290. On the other hand, what are classed in the reports as 'general deposits,' referring presumably to the funds of depositors subject to all the rules which govern deposits of individuals in banks, amounted on January 1, 1898, to $198,229,029, but at the opening of 1903 had risen to $529,001,547. It is probable that the classification of deposits as above is somewhat loose; nevertheless, the statement is sufficient to show the enormous growth of the purely banking side of the trust company business. The banking laws of the United States and of the various States provide without exception for the maintenance of a specified percentage of deposit funds in cash reserves. This percentage, in national banks, varies from 7 per cent. to 25 per cent. of the total deposit liabilities. As the above citation from the trust company act will show, no such restriction has been applied in the case of the trust companies.

The question whether the cash deposited with the banks was a legitimate reserve for all purposes has been the bone of contention in controversy on the subject of trust companies. The banks have contended that it is not and that the trust companies should be required to maintain in cash an adequate reserve. The trust companies have in general answered that the funds deposited by them with the banks, if they are properly secured by the banks' own reserve, should be a sufficient guarantee against any sudden demands by the trust companies' depositors. In the early part of 1902 this controversy became acute. At that time 27 trust companies in Greater New York used by arrangement the facilities of the New York Clearing-house, for the purpose of exchanging and redeeming checks paid into them. Such checks were delivered by the trust company to a bank specified as its clearing-house agent, and by that agent were properly exchanged in the daily clearings. On April 29, 1902, the New York Clearing-house adopted the following resolution: "Every institution which hereafter may be granted permission to clear through a member of this association shall be required to keep in its vaults such cash reserve to its deposits as the clearing-house committee may determine. The percentage of such reserve, however, is not to exceed that required of banks members of the Clearing-house Association." The rule did not apply to any of the numerous trust companies at that time actually using the clearing-house facilities. A year later, on February 8, 1903, the following more drastic resolution was adopted by the clearing-house: "Every non-member institution (not a bank required by law to maintain a specified reserve) now or hereafter sending its exchanges through a member of the association shall on and after June 1, 1903, keep in its vaults a cash reserve equal to 5 per cent. of its deposits; and on and after February 1, 1904, such cash reserve shall be at least 7½ per cent. of its deposits, and on and after June 1, 1904, such cash reserve shall be such percentage as shall from time to time be fixed by the clearing-house committee, but not less than 10 nor more than 15 per cent. of its deposits. The reserve hereby required shall be an average reserve as against the average deposits as shown upon its weekly statements."

A vigorous controversy arose as to whether the trust companies should submit to this regulation. It was pointed out that for many of them the clearing-house facilities were not indispensable, and that they could arrange individually for the redemption of checks paid in to them. On the basis of this reasoning 10 trust companies, including several of the largest institutions of the kind in New York City, formally withdrew from the clearing-house. Those which remained, numbering 17, acceded to the clearing-house rule and began to build up a cash reserve in accordance with its requirements.

TRUSTEE. See Trust.

TRUSTEE PROCESS. A legal process used in Massachusetts and several other New England States, corresponding to the garnishee process in use in most jurisdictions. See Attachment and Garnishment, and consult the authorities there referred to.

TRUST FUND DOCTRINE. A theory adopted by the United States courts, to the effect that the capital stock of a corporation is a *trust fund* for the payment of its debts. This theory probably originated in the rule that subscribers for stock are liable up to the par value of the stock subscribed for by them. The incidents of an equitable trust are not applied in case of an insolvent corporation. Any diligent creditor may satisfy his whole claim, even to exhausting the entire assets of the corporation, if he levies execution before the other creditors, and in absence of a statute to the contrary an insolvent corporation may make a preference of creditors in paying debts. If the assets and capital stock were a true trust fund for the benefit of creditors, a court of equity would compel an equal distribution of the assets among all the creditors. The term *trust fund*, therefore, seems an unfortunate misnomer of a just and equitable rule, but no hardship is created thereby. See Equity, and the authorities there referred to. See also Trusts.

TRUSTS. The word Trusts in this article is used of large corporations or associations of corporations or of individuals mostly engaged in manufacturing, which possess sufficient power to fix the prices of their products, in part at least, on the principle of monopoly. It does not include railways or combinations of railways, or Trusts in the technically legal sense.

Industrial Conditions Leading to Formation of Trusts. The Trusts are a late development, since, until late in the nineteenth century, industrial conditions were not favorable for their formation. In earlier times organizations possessing monopolistic power were either created by law or secured their power through the possession of some natural advantage, such as the exclusive possession of certain natural resources, as mines, etc., or through the advantage which comes from the exclusive occupancy of positions of advantage in doing their work—railroads, telegraphs, etc. In the modern Trust we often find combined with the advantages of great capital and perfected business organization also some of these natural advantages, but they are not the essence of the Trust advantage. The chief causes, from the industrial point of view, which have led to the organization of Trusts, are: (1) The existence of competition which was practically ruinous in its nature, brought about in part by the ease of intercourse between persons in different localities, and by the difficulty of withdrawing readily capital once invested in fixed plants. Such competition almost of necessity at times will become so fierce that all parties concerned will fail of making any profit. (2) The possibility of saving industrially many of the wastes which come from the competitive system, provided the interests of the various competitors are harmonized. Without discussing in detail these wastes of competition, there may properly be mentioned the salaries of traveling salesmen, the expense of keeping up expensive show windows, the cost of competitive advertising, the loss from undue extension of credits, the loss of custom which comes from carrying only a partial instead of a complete stock, the loss from the payment of cross freights, the loss from running manufacturing plants to only part of their capacity or part of the time. There may be mentioned also as a gain from combination the saving from standardizing the machinery and from prevention of the waste of time due to stopping and changing machinery, the saving from the most efficient organization of laborers and from managing all plants in an enterprise by the most skillful men instead of having part of them directed by men of meager ability, the certainty of a regular supply of raw material, and the most efficient use of by-products.

OTHER INFLUENCES AS CAUSES. Aside from the industrial conditions that have led to the organization of Trusts, certain other influences are to be noted. (1) The promoters of the large enterprises have in many cases succeeded in making very large profits from the organization. Likewise the financiers who have underwritten the stock have been able to exact very large payment for the risks which they have taken. The immediate personal interest of the promoter and financier has thus been a very powerful factor—sometimes even the most powerful factor in bringing about the combinations. (2) Governmental favors of various kinds have sometimes tended in the same direction. Although the protective tariff can scarcely be mentioned as a direct cause of the organization of industrial combinations, it is doubtless true that when an industry which otherwise would not have prospered has been first made very profitable by a protective tariff, so that numerous rival establishments have invested large sums of money in it, the consequent rivalry has led to the formation of combinations. It is also probable that in certain instances the protective tariff, by lessening foreign competition, has promised to the promoters of a combination the opportunity for greater profits than could have been anticipated without the existence of the tariff. In this indirect way, therefore, we may well consider the legislative favor of the protective tariff under certain circumstances as an indirect cause of the Trust. Similarly, the monopoly granted by the patent laws, by copyrights, by trade-marks, and other legislative benefits, have led to the organization of some of the great combinations.

EXTENT OF COMBINATION MOVEMENT. As yet, there are no satisfactory statistics regarding the extent of the combination movement in this country. The only material of this nature that is trustworthy is that secured by the United States Census of 1900, published in volume vii., part i., of the *Report on Manufactures.* This report included only those 'Trusts' which consist of a number of formerly independent mills which had been brought together into one company under a charter obtained for that purpose. Accordingly many establishments which might properly have been included under the word 'Trusts' were excluded. Moreover, many of the largest corporations organized during the last few years, including the United States Steel Corporation, were organized later and hence were not included. The figures given, however, include 185 combinations with 2040 plants. The total capitalization was $1,436,625,910. The total cost of materials used was $1,089,666,334, and the value of the products $1,667,350,949. The total gross value of all manufactured products enumerated in the census was $13,004,400,143. For the purpose of comparison there should be subtracted from this total the value of the products of the hand trades or the mechanical and neighborhood industries, since these are not adaptable to the form of management known as the industrial combination. There remains a total gross product of industries susceptible of combination into Trusts of $11,820,784,665. Comparing this with the product of the industrial combinations, it seems that in 1900 the Trusts produced nearly 14.1 per cent. of the total gross product of the manufacturing industries of the country, as enumerated by the census.

Doubtless at the present time this ratio would need to be somewhat increased. Yet it would probably be fair to say that even at the present time the Trusts do not include more than 25 to 30 per cent. at the outside of all the industries in the country readily susceptible of industrial combination. It is impossible at the present writing to say more than that the Trusts have developed very rapidly of late years, and that they apparently, though not certainly, are absorbing steadily a continually growing percentage of the entire industries of the country. It seems, however, to be equally clear that there are many lines of industry which are not susceptible of management under the Trust organization, and a point will probably be reached within the not far distant future when industries which, from their nature, can be advantageously organized into Trusts will all substantially be so organized, and those not capable of advantageous organization in this form will be recognized as industries normally managed by independent producers.

THE MONOPOLY CHARACTER OF THE TRUSTS. Many of the Trusts are closely connected with natural monopolies which give them a decided advantage over their competitors. It is well known that the Standard Oil combination, in its earlier days at any rate, derived great advantage from the special rebates which it received from the railroads. There is also reason to believe that many other of the later combinations have received somewhat similar favors. The United States Steel Corporation, as well as some of its constituent companies, has made it evident that one of the great advantages possessed by these organizations is the ownership of mines from which they derive a large part of their raw material. Through this ownership of a large percentage of all the available raw material in the country they are able to put their rivals at a decided disadvantage. Certain Trusts also may in certain localities control so large a percentage of the raw material that they may readily crush their rivals in those localities, as, for example, the Standard Oil Company in its local control of oil wells, the salt combination in its control of salt wells and mines, etc. The extent to which a Trust, therefore, may in itself be a monopoly depends often to a great degree upon the extent to which it has a monopoly of the raw material of the industry which it seeks to control. The effects of the Trusts upon prices and their legal and social status in the community may in many cases depend upon this one factor.

PROMOTING AND FINANCING. If, as is often the case, the promoter organizes a new company to take over the various plants which he is intending to combine under one management, or to develop some new patent, it has been the common practice for him to issue stock far beyond the actual cash value of the plants under consideration; then to pay for these plants with as much of the stock of the new company as was necessary to secure them, retaining the balance for his own services. In other cases, when the company is organized, the distribution of the stock among the different parties in interest is agreed upon jointly, and the promoter receives a certain percentage of the entire amount as his reward. Inasmuch as he in many cases takes considerable risk, and as the success of the enterprise is practically due largely, if not entirely, to his initiative, it has at times been possible for him to secure for his reward as high as 20 per cent. of the capital of the organization, paid to him in common stock. With such large rewards as are often hoped for and sometimes obtained, it is evident that the interest of the promoter may become a very direct cause for the formation of the Trusts.

Scarcely less prominent than the promoter in this regard is the financier. When either a new enterprise is to be started or a combination of existing establishments is to be made, it is usually necessary to raise a considerable amount in cash, in order that the new institution may start with capital in hand. Frequently also many of the plants purchased need to be paid for in cash. The stock of the new company is ordinarily the source from which it is desired that such cash should come. Inasmuch, however, as the general public is not likely to take the stock immediately and pay for it in cash, it is desirable that some one be found who will underwrite it, that is to say, who will take the stock and agree to furnish in exchange therefor an agreed-upon sum in cash at a certain fixed date in the future. For this service, so speculative in its nature, the financier ordinarily demands and frequently receives very high compensation. In certain instances, which were cited before the United States Industrial Commission, for each $100,000 in cash furnished, the promoter received $150,000 in common stock, while the underwriter, the capitalist, received $150,000 of common stock, and in addition thereto $100,000 in preferred.

CAPITALIZATION AND OVERCAPITALIZATION. Of late years there has been a strong tendency toward overcapitalization. The promoters have ordinarily adopted secret methods in the organization of their companies, and many of the larger Trusts have not been ready to give much information, even to the stockholders themselves. In consequence, large blocks of stock have at times been unloaded upon the public in prosperous times which have proved to have comparatively little value. It is usually stated by business men that overcapitalization has practically no influence upon wages or upon prices of products—that in a comparatively short time the stocks are estimated at substantially their true value, and that in consequence an overissue of stock does little harm. On the other hand, it is asserted by many, and there is certainly reason in their contention, that the overissue of stock by somewhat secret methods gives a decided advantage to those who are managing the organization, and that in many cases without laying themselves open to legal attack the promoters may easily secure from the public much more capital than the actual business would justify. Moreover, even when the organization is running, if secret methods are adopted, the directors who know the exact conditions of the business are often tempted to manage the business for their own benefit as dealers in stocks, rather than for the legitimate profit that would come only from manufacturing.

When a company has once been overcapitalized, also, there is naturally and properly a desire on the part of the directors to pay reasonable dividends to the stockholders. This temptation is at times so great or the pressure from the stockholders themselves is so insistent that often, especially when competition is not severe, prices will be held at rates higher than would be beneficial to the business in the long run. So, also, efforts to reduce wages may often be attempted temporarily, in order to secure dividends before the next election of directors. While this policy must in the long run prove unwise, and while in the long run stocks will doubtless exchange for something like their actual value, for considerable periods of time, if secret methods are practiced, overcapitalization may do harm not only to investors, but also to laborers and to the general consumers.

FORMS OF ORGANIZATION AND MANAGEMENT. While the form of organization of the Trust may often not have any material effect upon its economic influence, it is still very frequently true that the form is determined to a considerable extent by the legal institutions of the country; and sometimes the form of organization is of significance not merely from the legal point of view, but also from the economic. When some years ago the pressure of competition arising from the large amount of capital for investment in this country had tended to lessen the profits of manufactures, the first effort to lessen this competition naturally resulted in agreements upon prices or in agreements among different manufacturers to divide the selling territory among themselves, or in some other similar form of agreement which left to each establishment complete autonomy as regards its own management, but which brought about some form of an alliance to lessen the competition. Such agreements were usually and more or less accurately called Pools. (See POOLING.) This form of agreement (Kartell) is still common in Germany, and is, in fact, the usual form of agreement there where the courts uphold such contracts. In the United States, on the other hand, the courts have very generally held that such agreements were in unreasonable restraint of trade, and in consequence void, as contrary to public policy. The parties to the pools, therefore, knowing that they could not be legally bound, frequently violated the terms of the agreements by increasing their output beyond the amount agreed upon, cutting prices, and by other similar means. To overcome these difficulties, the form of the Trust was at length invented and put in practice—in the first place by the Standard Oil Company, in 1882. Under this form of organization, the stockholders of each of the separate companies assigned their stock to a few trustees, giving thus an irrevocable power of attorney. In lieu of the stock assigned, the trustees issued trust certificates to the stockholders of the separate companies, and upon these trust certificates profits were divided. All of the earnings from the different members of the company were pooled, and each manufacturer received his due share as evidenced by the certificates regardless of the question whether his establishment were running or closed. The trustees, having in their hands the voting power of all the stockholders, elected whatever persons seemed to them best as officers of the separate companies. In this way the management was absolutely unified and the interests of all parties concerned became one. The courts finally holding that this Trust agreement was illegal, the plan was later adopted of organizing a new company which should buy up all of the separate plants of the different companies entering the combination, so that in this way a unified management was secured within the law.

In order that a more convenient form of handling the properties of the different companies might be secured, and that under certain circumstances somewhat greater flexibility of management could be attained, a third form of organization was later adopted which was in many respects quite like that of the earlier Trusts. In this form a new company is organized as a stock-holding company. This company then buys up all or a large proportion of the stocks of each of the companies coming into the organization, and holds these stocks. The officers of the central organization are thus in a position, by voting the stocks of the different companies, to elect the directors and officers of those companies and thus control their policy.

Prices. Competitive prices, it is frequently assumed, will in the long run be fixed mainly by the cost of production of that part of the stock which is produced at the greatest disadvantage. Monopoly price, on the other hand, is fixed at that point which will secure to the monopolist the greatest net return. If greater return will be secured by lowering the price and increasing the sales, the price will be lowered. If the net returns will be greater by increasing the price, even though the number of sales be lessened, that policy will be adopted. In technical discussions regarding prices, the assumption is usually made of either a régime of free competition, or of what is substantially monopoly. In a practical discussion of the effects of Trusts upon prices, we must recognize that there may be certain monopolistic powers which may enable prices to be raised somewhat above the competitive rate, but which are still not sufficient to enable the Trust to fix prices entirely regardless of a potential competition. So, also, this monopolistic power may vary in degree in different industries or in the same industry at different times.

If the economies of industrial combination spoken of before are great, it is evident that without lessening profits prices of the finished product might be placed somewhat lower than those under the competitive régime, or prices of the raw materials used might be raised above those prevailing under the competitive régime without lessening profits. We see, therefore, that it is within the power of the managers of the Trusts, provided the Trust has been carefully organized in an industry adapted for combination to put prices below the competitive rates in order to drive out competitors, and then if they have secured monopolistic power thereby, to put prices, within certain limits at any rate, above competitive rates.

Whatever may be the theoretic possibilities, however, under the Trust system, it is essential to note what has in fact been the result, inasmuch as, in addition to the technical economic powers that have been suggested, the psychological factors of public opinion, of demands of laborers, of the boldness of the managers, etc., may all enter into the problem as factors in price determination. Although the Trusts have been in existence for a considerable length of time, it is still as yet altogether too early to determine what the ultimate effect of the Trust upon prices is to be. At the present time, however, there are many instances to show that in individual cases, for short periods of time at any rate, the Trusts have actually lowered prices below the former competitive rates. Likewise numerous instances can be found of prices raised by the Trusts above former competitive rates. The surest way to test the effect of the combination upon prices is to determine the margin of difference between the cost of leading raw materials used and of the finished products. If an industry is simple in its nature, so that the raw material forms a large part of the value of the finished product, this test can be made with comparative ease, as, for example, in the case of sugar refining, oil refining, the manufacture of alcohol, etc. Several industries were subjected to this test by the Industrial Commission, with the general result that up to date the influence of the Trust had apparently been to raise the margin between the price of the raw material and that of the finished product somewhat above that obtained under the competitive system. This is a result which seems to establish beyond all doubt the fact that unless the cost of manufacture had been increased—a supposition clearly contrary to the fact as claimed by the Trust people themselves—their profits must have been materially increased; and that the Trust had in reality raised prices to consumers, even though the actual price of the finished product may over a series of years have fallen. On the other hand, in certain instances, it was shown that although this had been the early experience and the first result, showing clearly a decided monopolistic power on the part of the combination, this margin had later been lessened, apparently under the pressure of potential, if not of actual competition. It is a fair assumption to make that for the time being at any rate, if the Trust secures considerable monopolistic power, it will place prices somewhat above the competitive rates, although in certain instances it may possibly be true that the saving in the cost of production will enable the combination to keep prices as low as would be possible under the competitive system, while still increasing its profits. On the other hand, it is also safe to conclude that where the chief source of monopolistic power is merely that which is derived from great capital or from a minor association with some natural monopoly, either actual competition will eventually set in or a potential competition will appear so threatening that prices in the long run will be maintained at only a little above—possibly not even at all above—competitive rates.

Wages. As indicated in the discussion on prices, so far as the Trusts really make savings through their new method of organization, they have a surplus fund which could be used in some way. Testimony before the Industrial Commission, and also the events of the last few years as reported in the public press and in public meetings, seem to show that in certain instances the laborers have gained slightly from being able to take advantage of this increased ability of the Trusts to pay. The statistical investigation made by the United States Department of Labor at the request of the Industrial Commission in 1900, while the material was not complete enough to reach positive conclusions, indicated that, so far as the evidence went, the industrial combinations had, on the whole, not brought about any lowering of the wages of labor, and had probably produced a slight increase.

The attitude of the Trusts toward the laboring-classes and toward the labor unions has apparently not differed materially from that of individuals and corporations under the competitive system. Some oppose trade unions; some favor them. Some are kindly disposed toward the laborers; some are disposed to grant them no favors. So far as a tendency can be detected, it seems to be toward the consolidation on the one hand of the laborers into larger and larger unions in order that they may be able to hold their own against the combinations, and on the other, for the larger combinations to recognize that as they are themselves organized, they must themselves deal with an organized body of laborers. If this tendency can be seen, however, it must be recognized that there are many exceptions.

It is somewhat encouraging to note that in many instances the unions and the Trusts are uniting upon trade agreements for a period of a year or several years, and that through this system of trade agreements the danger of expensive strikes is being lessened, although as yet this custom has become by no means universal. There appears also to be a tendency for the trade unions and the employers to unite for the benefit of both and to exercise their power at the expense of the consumers by maintaining prices higher than would obtain under the competitive system. It is to be expected that this union of employers and laborers against consumers is likely to become more frequent if the Trusts and the unions increase in number and strength.

Social Effects. It has often been charged that the great corporations and Trusts exert a corrupting influence upon legislatures and the courts. It is probable that in individual cases this charge is true. On the other hand, legislatures have not been free from such charges under the competitive system, and it probably would be difficult to prove absolutely that conditions are worse now than they were before the great industrial corporations were formed. The remedy for such an evil would seem to be chiefly in improving the character of our legislatures.

A more significant consideration is whether the Trust, by bringing so many individuals under one centralized management, destroys to any material extent the powers of self-reliance and of self-direction on the part of individuals which are naturally developed by the struggles of the competitive system. Opinions differ to a considerable extent on this subject, but there can be no doubt that, although the opportunities for a man to start an independent business in certain lines of industry are lessened, on the other hand the competition for promotion and for positions of responsibility within the combination itself is severer in the case of the great corporation than in the case of the private business or partnership. When a group of two or three partners are managing a business, they may readily give preference to their sons or friends even when the business ability of such persons is not of the highest type. When the interests of thousands of stockholders must be considered, and there are large boards of directors, each feeling that his position depends to a considerable extent upon the success of the business, favoritism cannot be shown to any very great extent.

Legal Position. When a Trust or combination is organized, its rights and powers are determined by the ordinary rules of common and statute law applicable to the particular form of organization adopted. That is, if the combination is a Trust, its rights and powers are determined by the ordinary rules of law governing Trusts; or if the combination is effected by one of the methods of corporate combination, its rights and powers are determined by the general law of corporations. Aside from these questions of the methods of organizing combinations, the Trusts raise no peculiar legal issues except that as to their legality when organized.

In ascertaining whether a combination is unlawful at common law, it should be remembered that the mere combination or coöperation of several individuals is not in itself unlawful, and in the case of partnerships and corporations combination of individuals is encouraged by the law. Combination by corporations, however, as has already been indicated, when not authorized by statute, may be such an abandonment or misuse of their corporate franchises as to be illegal under the general law of corporations. In general it may be said that combinations are unlawful *per se* only when the purpose of the combination is unlawful or against public policy, or when the means adopted by the combination for effecting its purposes are unlawful or against public policy.

The grounds upon which combinations have been held to be unlawful at common law may be somewhat roughly classified as follows: (1) That the contract (when the combination has been effected by contract) is illegal and void at common law because in restraint of trade. (2) That the combination is an unlawful conspiracy, either civil or criminal. (See CONSPIRACY.) Technically the second class includes the first, since there can be no combination without two or more parties to it who are technically guilty of conspiracy where the purpose is to enter into an illegal contract. Since, however, each is recognized as a distinct ground for declaring combinations illegal, the classification may be adopted as both convenient and practical. For a full discussion of the legal doctrines relating to restraint of trade and conspiracy, reference should be made to those topics. (See also MONOPOLY, ENGROSSING, FORESTALLING, REGRATING.) With reference to conspiracy, it may be said that combinations are conspiracies, and therefore unlawful, when the purpose of the agreement or combination is either to do something unlawful or to do something lawful in an unlawful manner. In general, combinations are held to be illegal because of their purposes and methods when they restrain fair competition or create oppressive monopolies. Owing to the difficulty of applying this test to any particular case, it may be extremely difficult to draw a clear line of distinction between those combinations which are lawful and those which are unlawful.

At common law the remedies of individuals against acts of illegal combination are limited to the recovery of any damage suffered because of the unlawful conspiracy involved in the combination or to the securing of an injunction restraining those joined in the combination from doing some threatened injury to the plaintiff. In either case it is necessary for the plaintiff to show actual damage suffered by him or that the defendant threatened to do some act causing such damage. When the combination is in the corporate form and is acting outside its corporate powers, or its constituent corporations have ceased to act as separate corporations so as to amount to an abandonment of their charters, the State may proceed against the corporate combination or any of the constituent corporations to compel a forfeiture of its charter by *quo warranto.* There is, however, no other method at common law by which either the State or a private individual could proceed against a combination on the ground that it is illegal and is working a public injury. As a result of agitation upon the subject of Trusts, almost all of the United States have adopted statutes or clauses in their State constitutions restraining or prohibiting all contracts, agreements. undertakings, or combinations in restraint of trade or tending to create monopolies, whether such restraint would have been unlawful at common law or not. In general the courts have held that these statutes are constitutional under both State and Federal constitutions, and not in violation of the constitutional provisions against abridging the freedom of contract, depriving citizens of liberty or property without due process of law, or denying them equal protection of the laws. In the interpretation of these statutes, however, the courts have justly regarded them as an innovation upon the common law to be interpreted with strictness and caution. Moreover, the difficulty of giving such legislation its proper effect without making it subversive of established rights of property has to some extent prevented all these restraining acts from having the effect intended. It may be said that the principal test to be applied in determining whether statutes of this class are violated is whether the act or agreement complained of was done with intent to control prices or whether such would be a natural result of the act or agreement. They usually provide that contracts made in connection with such an act or agreement shall be void, and attach criminal or quasi-criminal penalties for their violation. In some States parties injured by such violations of anti-monopoly statutes are given rights of action to recover damages for the injury suffered.

A far more effective agency for restricting the growth of monopoly is the exercise of the power of the several States to control all corporate enterprises within their respective territories. A State may grant to a corporation its charter and power to do business upon such terms as the Legislature may choose, and it is also within the constitutional power of a State to impose any terms, however exacting, as a condition to which corporations created under the laws of other States must conform if doing business within its limits, provided such conditions do not interfere with interstate commerce, the power of regulation and control of which is by the United States Constitution lodged with the Federal Government.

A State may thus limit the amount of capital of a corporation organized under its laws; and it may by its charter or general laws existing at the time of its creation limit or regulate its business. In the same manner a State may impose similar or even additional conditions upon all foreign corporations wishing to do business that is not interstate commerce within the State. In this connection, however, it should be remembered that the charter or other legislative authority to a corporation to do business once granted is deemed to be a contract, and that the State is forbidden by the United States Constitution to impair the obligation of contract. See CORPORATION; CHARTER; DARTMOUTH COLLEGE CASE.

It will be seen that the powers of restriction just referred to are limited to corporations and have no application to natural persons or partnerships. The important above-mentioned limitations upon the power of the States to control corporations, coupled with the fact that it has been the policy of many of the States to grant to corporations organized under their laws practically unlimited power, have in effect seriously interfered with any effective statutory restriction of monopolies by the several States.

The Federal Government may to some extent restrain monopoly under cover of its constitutional power to regulate interstate and international commerce. Its power in this respect has been deemed to be practically absolute. It cannot, however, be said at this time that the power of Congress to control or restrain the business of individuals or corporations by enactments that are not intended primarily for the purpose of controlling or regulating interstate commerce, but for the purpose of restricting, or making unlawful, or assuming control over, a business which is lawful and unrestricted in the several States, is without limitation, since that question has not been definitely and finally determined by the Supreme Court of the United States. Acting under its power to regulate commerce, Congress in 1887 enacted the Interstate Commerce Act, having for its purpose the control and regulation of business carried on by common carriers engaged in interstate commerce. Its particular object was the prevention of unlawful discrimination in rates by common carriers engaged in interstate commerce, which had contributed in a large degree to the growth of monopolistic enterprises. This was followed in 1890 by a statute for the protection of interstate and international trade, commonly known as the Sherman Act (26 United States Statutes at Large, 209).

This statute provides that all contracts, combinations in form of Trusts or otherwise, or conspiracies in restraint of interstate or international commerce are illegal, and that all persons participating in such agreement, combination, or conspiracy are guilty of a misdemeanor and subject to a penalty for violation of the act. The statute also provides that all goods in transportation in violation of the act may be seized, and their forfeiture compelled by a proceeding brought in behalf of the Government, and that a proceeding may be brought by the Attorney-General enjoining all acts in violation of the statute and for the dissolution of contracts entered into in violation of it.

It has been held by the courts that this act does not apply to monopolies created and authorized by a State, but that it is intended to apply to all direct restraints of trade by individuals or corporations, whether such restraints would have been deemed reasonable or unreasonable at common law. The restraint or monopoly need not be complete. The statute is violated if the contract or combination tends to such monopoly. Notwithstanding the scope and severity of the statute, it has been found not to be particularly effective in restraining the growth of monopolies or Trusts, so called, and it is not unlikely that further legislation of a similar character will be enacted.

Anti-trust laws were enacted by Kansas, Maine, and Michigan in 1889. Other States soon enacted similar measures, and at present some thirty States have laws prohibiting combinations in the form of trusts. In some States, as, for example, in Ohio and Missouri, these laws are very sweeping. In the latter State persons or corporations convicted under the law are deprived of the right to use the State courts in the collection of debts. Such State laws have, of course, no application to the acts of a single corporation, and, as most trusts are organized under that form, are of limited efficacy. In a number of cases the State courts have, after long continued prosecutions, succeeded in proving the existence of unlawful combinations. Thus in 1906 the attorney-general of the State of Missouri was successful in compelling the president of the Standard Oil Company to admit that that company controlled certain concerns doing business in the State of Missouri, apparently in competition with the Standard Oil Company. While existing as quasi independent corporations under the control of the Standard Oil Company, these concerns were operating in violation of the Missouri anti-trust law, but no such violation would appear when they openly became constituent parts of the Standard Oil Company. The principal effect of such State laws is to bring about changes in the form, but not in the essential features, of so-called trusts.

It is of course possible for a State to exclude from business within its boundaries a corporation chartered in another State; but since no State can prevent the shipping of the goods of such a corporation across its boundaries, the advantage of such exclusion is illusory.

In 1905 an attempt was made by the State of Kansas to prevent the Standard Oil Company from controlling the output of the Kansas oil fields. Three laws were enacted, one declaring pipe lines common carriers, a second prohibiting discriminations on pipe lines and railways, and a third providing for establishing a branch penitentiary in the oil fields, to be used in refining oil. The last measure was subsequently declared unconstitutional by the State Supreme Court. Proceedings to oust the Standard Oil Company from the State under the State anti-trust laws were instituted, but were eventually dropped.

In recent years the view has gathered strength that a main source of the power of trusts consists in discriminating railway rates and other practices whereby the trusts are given advantages over their competitors in the transportation of their products. This view was a chief cause of the revision of the Interstate Commerce Act undertaken in 1906 (see RAILWAYS). In a report of Commissioner Garfield of the Bureau of Corporations to the President on the relations of the Standard Oil Company with the railways, submitted to Congress May 4, 1906, it was shown that up to a recent time the Standard Oil Company had enjoyed preferential treatment from the railways. This preference in some sections of the country had taken the form of direct rebates; more commonly it consisted in exceptionally favorable rates from the points where the Standard Oil Company had its manufacturing plants. The failure of certain roads to agree upon a division of through rates, and their consequent failure to establish through routes for oil shipment, had given great advantages to the Standard Oil Company, shipping by pipe line, and had, in fact, given a virtual monopoly of New England points to that company. In his message accompanying the report, President Roosevelt estimated the gains to the Oil Trust from preferential treatment by the railways at $750,000 per year. The President stated, on information furnished by the Department of Justice, that the Sugar Trust likewise enjoyed preferential treatment from the railroads. Further evidence of the extent to which the trusts have enjoyed unlawful discriminations from the railway companies is afforded by the numerous indictments found, by Federal Grand Juries in various parts of the country, against the Beef Trust, the Standard Oil Trust, and other combinations for receiving rebates. In August, 1906, the Standard Oil company was indicted on 6,428 counts by the Federal Grand Jury sitting in

Chicago, the charges arising out of alleged rebates on oil shipped to Southern, Southwestern, and Western points.

The new railway-rate law, by giving the Interstate Commerce Commission the power of fixing rates, by adding the penalty of imprisonment to that of a fine for railway officials convicted of giving rebates, by its provision for publicity of railway accounts, and by the provisions placing private car lines, side tracks, and all other facilities for transportation under the supervision of the Commission, is expected to do away with many of the special advantages enjoyed by the trusts. By the provision prohibiting a railway from transporting, in interstate commerce, articles of its own production not destined for its own use, the process whereby the railway companies have been enabled in large measure to monopolize the business of mining anthracite coal is rendered impossible.

In 1905 and 1906 the Department of Justice conducted an investigation into the business of several of the trusts, among them the Tobacco, Beef, Paper and Oil trusts, to determine whether tne Sherman law of 1890 was being violated by them. The difficulty of securing evidence against such corporations was measurably diminished by a decision of the Supreme Court of March 12, 1906, holding that the principle that no man can be required to give evidence incriminating himself does not excuse a witness from testifying against a corporation of which he is an employee.

In the Congressional session of 1902–03 the law creating the Department of Commerce and Labor made provision for a Bureau of Corporations, whose duty it should be to collect full data regarding Trusts, with the purpose of thus acquiring information which might be used, if deemed advisable, for further legislation. The President was given power to make public such of this information as he thinks wise, in order that through the remedy of publicity some of the evils might possibly be checked. By a resolution of the House of Representatives of March 7, 1904, the Secretary of Commerce and Labor was requested to investigate the causes of the low price of cattle and the high price of beef, and to ascertain whether the large margins between the finished product and the raw material were due to combination in the industry, in the form of a trust. In accordance with the resolution an extensive examination of the business of the six great packing companies was made, during 1904 and 1905, by the Bureau of Corporations. The report, published in 1905, showed that while one of the six great companies, the National Packing Company of New Jersey, was controlled by three of the others, there was no further important common ownership of securities among the great packing companies. Whether or not a combination existed among the packers was not disclosed by the report, as the Department of Justice was at the time conducting an investigation to discover whether the companies were violating the anti-trust law. The report showed, however, that the six companies enjoyed no monopoly of the business. While the total number of cattle slaughtered in the United States in 1903 was 12,500,000 head, the companies under investigation slaughtered 5,500,000 head. In the eight leading packing centres in the West, the six companies do about 98 per cent. of the business, and in the cities east of Pittsburg they supply the greater proportion of the beef consumed.

With regard to the margin between the price of dressed beef and other beef products, and the price of live cattle, the report showed that there has been no tendency toward an increase since 1898, the earliest year covered by the investigation. The average difference in 1898 was $2.32 per hundred pounds in the first half of the year, and $2.81 in the second half. In the first half of 1904 it was $2.40, the increase being justified by the fact that higher prices for live cattle necessitate a wider margin. The total profits on sales were shown by the report to be less than is popularly supposed. Thus the sales of Swift and Co. in 1904 slightly exceeded $200,000,000, and the profits of the company, according to its annual financial statement, $3,850,000, thus giving a profit of only 1.9 per cent. on the volume of business. The sales of the Cudahy Company were $50,828,639; the profit $927,969, or 1.8 per cent. on the volume of business.

The report estimated the profit from private cars owned by the companies at from 14 to 17 per cent. on the cost of the cars, allowing for depreciation and cost of operation. Facts relating to unlawful railway discriminations in favor of the packing companies were withheld from publication, as falling within the province of the Department of Justice.

The chief significance of the report lay in the proof it gave that the Bureau of Corporations has sufficient power to obtain most of the facts relative to the business of large corporations. In 1905 and 1906 the Bureau of Corporations investigated the Oil Trust and made a report upon the relation of the trust and the railways (see above). Other investigations in progress concern the steel, sugar, tobacco, and lumber industries.

As the chief purpose of the Bureau of Corporations is to secure information upon which legislation for the regulation of corporations engaged in interstate commerce may be based, it is frequently necessary that the Bureau should obtain information relative to practices that are illegal under the anti-trust law. It was believed at the time that the Department of Commerce and Labor was established that so long as such information was not used as a basis of charges against the guilty parties, the principle that no man may be required to give evidence that may incriminate him would not be violated. In March, 1906, Justice Humphreyes of the United States District Court of Chicago, discharged certain officers of the packing companies, charged with violation of the anti-trust law, on the ground that by testifying as to the alleged unlawful acts before Commissioner Garfield, they became entitled to personal immunity from prosecution on charges based on such acts. The defendant corporations on the other hand were not entitled to such immunity. According to the principle laid down in this decision, it appears that the officials of any corporation under investigation by the Bureau of Corporations, may, if guilty of acts in violation of the Anti-trust law, secure personal immunity from prosecution by testifying to such acts before the Bureau. The effect of the decision would thus be to create serious friction between the Department of Justice and the Department of Commerce and Labor, since every investigation undertaken by the Bureau of Corporations at the direction of the head of the latter department would seriously interfere with action taken by the former department. In a message to Congress, April 27, 1906, President Roosevelt pointed out the difficulties created by this decision, and recommended the enactment of laws defining immunity in such a way as to deprive officials of corporations guilty of unlawful acts under the anti-trust law, of immunity in such cases. No action was taken upon the matter in the session of 1905-1906.

The decisions of the Supreme Court of the United States and of the United States Circuit Court, both in earlier cases, and especially in the case of the Northern Securities Company, indicate that the Federal Government has the power to prevent combinations among railroads or manufacturing corporations engaged in interstate commerce which are created for the purpose of securing monopoly, or which in actual practice do tend toward restraint of trade, and that whether this restraint is reasonable or unreasonable.

But although it is frequently asserted that under existing laws monopolistic combinations can be successfully regulated, the results of legal proceedings against trusts have been disappointing. In the most famous case — that of the Addyston Pipe and Steel Company, decided in 1899, the defendant companies were indeed enjoined from combining to restrain interstate commerce in cast iron pipe; but before the decision was handed down, the six defendant companies had sold out to a company chartered under the laws of New Jersey, which continued with impunity the practices alleged. Whether or not the Federal Government has power, under existing law, to prevent the consolidation of the leading corporations in an industry, with attendant monopolistic practices, is a question not definitely decided.

A plan for requiring all industrial concerns doing an interstate business to be incorporated under federal laws, has been widely advocated in recent years. If corporations are simply permitted to secure federal charters, it does not appear that the federal government could prescribe very drastic provisions as a prerequisite to a charter, since such provisions would lead the corporations to prefer State charters. To compel such corporations to secure federal charters is, according to the weight of legal opinion, beyond the powers of the federal government, under the existing constitution; and amendment of the constitution is impracticable.

A plan having the same end in view was proposed by Commissioner Garfield of the Bureau of Corporations in his first annual report to the Secretary of Commerce and Labor. As a corporation chartered by a State must have a license to do business in other States, it may also, it is believed, be required to secure a license from the federal government before it may engage in interstate commerce. As a prerequisite to the granting of such license, it is proposed that Congress should require whatever provisions might be deemed necessary as to publicity, capitalization, organization, and management, etc. Federal officials would have a right to inspect the books of such corporations, as they have at present in the case of railway and national banking corporations. Any corporation not having such federal license, or violating its terms, it was proposed should be denied the right of transporting its goods in interstate commerce.

The prohibition of the transportation in interstate of goods produced by monopolistic combinations was the essential feature of the Littlefield bill, which passed the House of Representatives in 1903. No action was taken upon the measure by the Senate. The difficulty with such legislation would of course consist in the determination of what combinations are to be regarded as monopolistic before the law.

The English Government has gone no further in the way of anti-monopoly legislation than the old provisions of the common law against monopoly and the somewhat rigid provisions of their corporation act regarding publicity in the promotion and management of companies.

In France the status of the law seems not to be definitely fixed, for although there are statutes existing against combinations to influence prices, and although there have been certain successful prosecutions under this law, notably in the case of the Copper Syndicate, still industrial combinations in the form of joint selling bureaus do exist without apparent legal opposition.

In Germany, contracts for fixing prices, controlling output, or in other ways tending toward the prevention of destructive competition have been upheld by the courts as reasonable, and the restriction of such combinations is apparently limited to those that can be shown to be contrary to public policy. In Austria the Government has made efforts to put the combinations under somewhat more rigid supervision, especially for financial reasons, but although there has been considerable feeling against the Trusts, as yet comparatively little has been done by either the legislature or the courts, and some very strong combinations have been in existence there for several years. Both in Austria and in Germany, however, Government commissions have been studying the subject with reference to further legislation, and so far as their recommendations go, the inclination is to recognize the combinations as proper, provided they place themselves sufficiently under Government supervision and conduct their business so that it will not be considered by the Government officials as contrary to public policy.

BIBLIOGRAPHY. Steinmann-Bucher, *Wesen und Bedeutung der gewerblichen Kartelle* (Leipzig, 1891); Halle, *Trusts or Industrial Combinations* (New York, 1895); Liefman, *Die Unternehmerverbände* (Leipzig, 1897); Pohle, *Die Kartelle der gewerblichen Unternehmer* (ib., 1898); Rousiers, *Les industries monopolisées* (Paris, 1898); Baker, *Monopolies and the People* (New York, 1899); *Corporations and Public Welfare*, report 4th annual meeting, American Academy of Political and Social Science (ib., 1900); *Report of Chicago Conference on Trusts* (Chicago, 1900); Collier, *Trusts* (New York, 1900); Ely, *Monopolies and Trusts* (ib., 1900); Jenks, *Industrial Combinations*, Bulletin of Department of Labor (Washington, 1900); id., *The Trust Problem* (4th ed., New York, 1903); *Reports of the United States Industrial Commission*, vols. i., ii., xiii., xviii. and xix. (Washington, 1900-1902); *Trusts and Trade Combinations in Europe*, State Department, Consular Reports, vol. xxi. (ib., 1900); Le Rossignol, *Monopolies Past and Present* (New York, 1901); Raffalovich, *Les trusts* (Paris, 1903); Meade, *Trust Finance* (New York, 1903); Moody, *The Truth about the Trusts* (ib., 1904); Tarbell, *History of the Standard Oil Company* (ib., 1904); Ripley, *Trusts, Pools, and Corporations* (Boston, 1905). Also consult the authorities referred to

under such titles as RESTRAINT OF TRADE; CONSPIRACY; CONSTITUTIONAL LAW, etc.

TRUTCH, Sir JOSEPH WILLIAM (1826-1904). A Canadian statesman, born at Ashcot, England. He was educated at Exeter, studied civil engineering under Sir John Rennie, and in 1849 removed to the Pacific Coast. From 1859 to 1864 he was employed in the construction of public works for British Columbia, and from 1864 to 1871 was chief commissioner of lands and works, and surveyor-general, for the same colony. He was also an *ex-officio* member of the excutive and legislative councils from 1864 until in 1871 British Columbia joined the Dominion federation. From 1871 to 1876 he was Lieutenant-Governor of British Columbia, and in 1876-89 was resident Dominion agent for British Columbia.

TRUXILLO, trōō-hēl'yō. See TRUJILLO.

TRUX'TUN, THOMAS (1755-1822). An American naval officer, born at Jamaica, L. I. Going to sea at the age of twelve, he was first an apprentice on an English packet, was subsequently impressed for service on an English frigate, and finally entered the merchant marine. Coming to Philadelphia late in 1775, he was made captain of the *Congress*, the first American privateer sent out during the Revolution. In command successively of this vessel, the *Independence*, the *Andrew Caldwell*, the *Mars*, the *Saint James*, and the *Commerce*, he captured numerous prizes, and overcame many vessels more powerful than his own. After engaging for a time in the East Indian service, he was appointed captain in the newly organized United States Navy, 1795, and was put in command of the *Constellation*. On February 9, 1799, during the short naval war with France, he captured, with the loss of only two killed and three wounded, the French frigate *Insurgente*, which lost 29 killed and 41 wounded. In the following year (February 1st), he likewise defeated the *Vengeance*, which, however, after surrendering, managed to escape. The French loss in killed and wounded was 160, the American 39. Subsequently he was put in command of the West India Squadron with the rank of commodore. Retiring from the navy in 1802, he lived for a time in New Jersey, and then removed to Philadelphia, where he was sheriff, 1819-1821. He published *Remarks, Instructions, and Examples Relating to Latitude and Longitude, also the Variation of the Compass* (1794).

TRY'ON, DWIGHT WILLIAM (1849—). An American landscape painter, born in Hartford, Conn. He studied under C. Daubigny Chevreuse and Guillemet in Paris; in 1886 became director of the Hartford School of Art and professor of art at Smith College, Northampton, Mass., and afterwards he settled in New York City. His earlier works show a trace of the influence of Daubigny, but his own personality was strong enough to prevail. His subjects are confined to New England, and are of the simplest description. His skill in analysis and in technique has given him a high place among American landscape painters. His general treatment is broad, and he is fond of the hazy effects of spring and autumn. Notable paintings, but in a higher key than is usual with Tryon, are "October Afternoon" (1903) and "Autumn—New England" (1903). Other important works include: "Morning Twilight" (1903); "New England Hills—August" (1901); "Dawn" (1901); "Winter Afternoon" (1894); "Morning" (1893). Some of his water-color work is also well known.

TRYON, Sir GEORGE (1832-93). An English admiral, born at Bulwick Park, Northamptonshire. He was educated at Eton, and entered the navy in 1848. In 1860 he was promoted to commander, and in 1866 to captain. In the following year he showed considerable talent for organization and foresight as director of transports for the Abyssinian expedition. In 1874-77 he was in command of a ship in the flying squadron, and from that time till 1887 served with the Mediterranean fleet. In 1884 he became rear-admiral, and in 1889 vice-admiral. His appointment in 1891 to the command of the Mediterranean station was a popular one, but there on June 22, 1893, off Tripoli, he was responsible for one of the most terrible naval accidents of modern times. During some manœuvres he ordered the battleships *Camperdown* and *Victoria*, which were proceeding in parallel lines, to turn inward, thus causing the former to ram and sink the latter with great loss of life. He went down with the *Victoria*. Consult C. C. Penrose-Fitzgerald, *Life* (London, 1897).

TRYON, THOMAS (1634-1703). An English zealot, known as the 'Pythagorean.' He was born near Cirencester, in Gloucestershire, England. He was taken from school before he had learned to read and put to spinning and carding (1643-46); and thereafter till his eighteenth year he tended his father's sheep. He then drifted to London. He joined the Anabaptists, but afterwards renounced their doctrines, through the influence of the mystical writings of Jakob Böhme (q.v.). At the age of forty-eight he began a long series of pamphlets, in which he recommended for drink only water, and for food only bread and fruit, with some liberty in the use of butter and cheese. His book on this theme is known as *The Way to Health* (1698), published originally in 1682 as *Health's Grand Preservative*.

TRYON, WILLIAM (c.1725-88). A British colonial Governor, born in Ireland. He secured a commission as captain in the British Army in 1751, and became lieutenant-colonel in 1758. Through his marriage to Miss Wake, a relative of the Earl of Hillsborough, First Commissioner of Trade and Plantations, he was appointed Lieutenant-Governor of North Carolina June 27, 1764, and succeeded to the Governorship July 20, 1765, after the death of Arthur Dobbs. He succeeded through the tact of his wife in securing £15,000 to build a Governor's house at Newbern, pronounced the handsomest building in the Americas. The heavy taxation required for this and the Cherokee expedition was one of the causes of the insurrection of the Regulators (q.v.), which he suppressed with severity. In July, 1771, he was transferred to New York, where he greatly strengthened the militia. In 1773 the Government house, at Fort George, near New York City, was burned, and Tryon and his wife barely escaped with their lives. He made a large grant of land to King's College (Columbia), and he himself speculated in Western lands. He visited England in 1774, and on his return in June, 1775, found the colony in rebellion. In October he took refuge on shipboard and remained in the harbor until Howe's entry in September, 1776. In 1777 he took active command of some loyalist troops, and in June, 1778, gave up civil for military duties entirely, and was promoted 'major-general in America.' In 1779 he made an expedition into Connecticut, where he burned Danbury. During the winter of 1779-80 he was in command of the New York district, but returned to England in 1780, and was promoted to the rank of lieutenant-general in November, 1782.

TRY'SA (Lat., from Gk. Τρύσα, now called *Geul-Bashi*). An ancient town, situated on a plateau (2475 feet high) in Southern Lycia, a short distance west of Myra. The site is of interest only from the Heroön erected near the end of the fifth century B.C. by a native prince. This is a quadrangular inclosure about 60 × 75 feet, with a door in the south wall. In the northeast corner stood the large sarcophagus, and in the southeast the small booths for the guard and the funeral feasts. The importance of the monument is in its sculptured decorations. Around the inner wall near the top are two rows of sculptured frieze, and a similar decoration adorns the outside of the south wall. Only the sculptures around the door show any trace of Oriental influence; the rest are evidently derived from good Greek models. On the outside are represented the expedition of the Seven against Thebes, a battle between Greeks and Trojans on the right of the door, and on the left battles of the Greeks with Amazons and centaurs. Inside on the south wall on the right are Odysseus slaying the suitors and the Calydonian Hunt, on the left a banquet and dance of youths and maidens. On the east wall, which is much mutilated, can be traced the deeds of Theseus, a battle with centaurs, and a banquet. The north wall contains the Dioscuri carrying away the daughters of Leucippus, a hunting scene, and the conflict of the Lapithæ and centaurs. The west wall contains the battle of Greeks and Trojans between the city and the ships, apparently the storming of the city of Troy, and the battle of Achilles with the Amazon. Apparently the artist was influenced by the great painters of the fifth century, and for this reason the frieze possesses a unique importance. Its total length is nearly 350 feet, and the height varies between three and four feet. First mentioned in 1841 by Schönborn, the ruins were excavated between 1881 and 1883 by an Austrian expedition, and the sculptures brought to Vienna. Consult Benndorf and Niemann, *Das Heroön von Gjölbaschi-Trysa*, with Atlas (Vienna, 1889).

TS'AIDAM or **CH'AIDAM**, chī′däm. See TIBET.

TSANA, LAKE. See TZANA.

TSAR. See CZAR.

TSARITSYN, tsȧ-rē′tsĭn. One of the most important ports on the Volga, situated in the Government of Saratov, Russia, where the Volga approaches within 40 miles of the Don (Map: Russia, F 5). Connected by rail and water with the interior of Russia, Tsaritsyn is the natural outlet for the region of the lower Volga, and to some extent of the region of the Don. The chief articles of commerce are fish, salt, petroleum, grain, lumber, wool, and mustard. The local manufactures are spirits, beer, and machinery. The town is poorly built. There is a fine Lutheran church. Population, in 1897, 55,967.

TSARSKOYE SELO, tsär′skô-y*e* sy*e*-lô′. A district town and the summer residence of the Russian Emperor, situated in the Government of Saint Petersburg, about 15 miles south of the capital (Map: Russia, C 3). It is a pretty town with extensive parks belonging to the royal residences and villas of the Court aristocracy. The Old Palace is characterized by great splendor and contains a fine picture gallery and the celebrated amber room. The Palace of Alexander, built by Catharine II., is less pretentious. A considerable part of the town's permanent population is made up of the military and Court employees. Tsarskoye Selo was formerly the seat of the Alexander lycée, where many of the most prominent literary men (including Pushkin) and statesmen of Russia were educated. Population, in 1897, 22,353. The railway line from Tsarskoye Selo to Saint Petersburg, constructed in 1838, was the first railway in Russia.

TSCHAIKOWSKY, chĭ-kôv′skê, PETER ILYITCH (1840-93). The greatest composer Russia has thus far produced, born at a small place called Votkinsk, in the Ural mining region, on May 7, 1840. He studied jurisprudence in Saint Petersburg, and in 1859 obtained a position in the Ministry of Justice. In company with a young poet named Apukhtin, who greatly influenced his future, he listened to Italian opera whenever an opportunity presented itself. This love of Italian music left its traces in Tschaikowsky's scores. He entered the Conservatory where Anton Rubinstein, its director, was attracted by the young man's ability. Tschaikowsky resigned his Government position, studied music with all the vigor of his nature, and on his leaving the Conservatory three years later, he continued to study orchestration with Rubinstein and took up the flute, piano, and organ. In 1866 he accepted the position of teacher of harmony at the Moscow Conservatory. It was at this time that he met the poet Ostrovsky, who gave him the libretto for his first opera, *Voyevoda* ("The Chieftain").

Tschaikowsky's first musical idols were Glinka, the father of modern Russian music, and Mozart. He venerated Beethoven and admired Schumann, but, singularly enough, he never cared much for Chopin. Schumann, with his short-breathed phrases, was the Russian's model in writing for the pianoforte. Tschaikowsky went on composing, undeterred by the lack of appreciation on the part of both the Rubinsteins. Even the brilliant and effective first piano concerto was picked to pieces by Nicholas, and so hurt was the young composer that he erased the dedication to Nicholas and substituted the name of Hans von Bülow, who rewarded the courtesy by producing the concerto in Boston on the occasion of his first visit to America (1875-76). Tschaikowsky made the acquaintance of Balakireff, who urged him to compose the *Roméo et Juliette* fantaisie overture. Now flowed forth a stream of songs, symphonic poems, concertos, symphonies, operas, chamber music, overtures, dances, many experimental in form, much that was mediocre and also some genuine masterpieces. An unhappy marriage, briefly endured, sent him into a retirement at Klin, which was occasionally interrupted by trips to Germany, France, Italy, Switzerland, and England. He met Brahms and liked the man, but never concealed an antipathy for his music. He admired Wagner, with many reservations, though he willingly visited Bayreuth. But he took no great interest in the music drama, preferring old-fashioned operatic forms. All his opinions, musical and otherwise, may be found in his *Diary*, and in his musical criticisms, which were edited by G. A. Laroche. His fame grew apace, and in the spring of 1891 he visited America, in response to the invitation of Walter Damrosch, and was present at the dedication of Carnegie Hall, New York. On November 6, 1893, Tschaikowsky died in Saint Petersburg, after a short illness, of cholera. His death evoked universal sympathy, and Russia learned from the western world that she had lost her greatest composer.

For many years the opposition to Tschaikowsky was based upon the allegation that he was not really one of the Neo-Russian nationalists, who with Tolstoy 'went to the people' for their themes. Tschaikowsky, like Turgenieff, was a traveled man of culture, and a cosmopolitan on certain sides of his art; but there was no truer patriot than this fiery-souled poet, who demonstrated his slavophilism in a hundred of his compositions. His happiest work is in the pure fantasy, or what he was pleased to term 'overture fantaisie.' Thus his *Manfred, Roméo et Juliette, The Tempest*, and *Francesca da Rimini*, gives us Tschaikowsky at the very top of his powers. The unfailing invention which marked his poetic works seemed to desert him when he attempted purely abstract music. A poet first, musician afterwards, Tschaikowsky was inspired by poetic themes. He was a born master of orchestration. The *timbres* of his instruments meant for him so many voices, and so his works are often tone-dramas, operas without words. Tschaikowsky's music reveals the mighty pessimism of his nation. His symphonies are often built upon typical phrases, taken from the folk-song; he is Russian in his operas, with their national texts and treatment. Some of his songs —he wrote over a hundred—are masterpieces: "Nur wer die Sehnsucht kennt," "Don Juan Serenade," "Disappointment," "Warum sind die Rosen so blass?" His Florentine string sextet is warm in color, and in his three string quartets he often strays across the borders into the pleasing country of the operatic. The world has come to recognize the last movement of the *Pathetic* symphony as an unparalleled embodiment of woe. But as a whole the work hangs loosely together. The fifth symphony is more homogeneous, the fourth, in F minor, more Russian. There are three piano concertos, a violin concerto, and many piano pieces. The symphonic poems, with their wealth of musical imagery, their dramatic power and thrilling effects constitute Tschaikowsky's claim to immortality. He had a predilection for ballet-music and left charming specimens of dance music in *Le cassenoisette* suite and other compositions in a light vein. His operas are seldom heard outside of Russia. *Eugene Onegin* (1879) is said to be a work of unequal genius. Besides it, *The Voyevoda* (1869), *The Maid of Orleans* (1881), *Mazeppa* (1882), and *Iolanthe* (1893) met with success. Other noteworthy works include the lyric drama *Snowdrop;* three ballets, *Le lac des cygnes, La belle au bois dormant* (1890), and *Le cassenoisette;* symphonies, symphonic poems, and a great mass of miscellaneous compositions. He published a *Treatise on Harmony* (1872); a translation of Gevaert's *Traité d'instrumentation;* and also wrote *Musikalische Erinnerungen und Feuilletons* (1899).

Consult the biographies by Rosa Newmarch (London, 1900), Knorr (Berlin, 1900), Modest, *Tschaikowsky* (Germ. trans., Leipzig, 1901), and Hruby (ib., 1902); also Huneker, *Mezzotints in Modern Music* (New York, 1899); Runciman, *Old Scores and New Readings* (London, 1899); and *Imbert, Profils de musiciens* (Paris, 1888).

TSCHERMAK, chĕr′mȧk, Gustav (1836—). An Austrian mineralogist. He was born at Littau, Moravia; was educated at the University of Vienna, and in 1868 was appointed a professor in the university and director of the Royal Mineralogical Cabinet. In 1877 he resigned the directorship. His contributions to the proceedings of the Vienna Academy are very numerous, and treat for the most part subjects of crystallography and petrography. He is also a prominent authority on meteorites. In 1871 he established at Vienna the *Mineralogische Mitteilungen*, published since 1878 as the *Mineralogische und petrographische Mitteilungen.* His publications include: *Die Porphyrgesteine Oesterreichs* (1869); *Die mikroskopische Beschaffenheit der Meteoriten* (1883); and a *Lehrbuch der Mineralogie* (1884; 5th ed. 1897).

TSCHIRNHAUSEN, chẽrn′hou-zen, **Ehrenfried** Walter, Count (1651-1708). A German scientist and mathematician. He was born and educated at Leyden. He traveled considerably in France, Italy, and Switzerland, and served in the army of Holland (1672-73). Tschirnhausen erected large glass works in Saxony, where he constructed burning glasses of unusual perfection and carried on his experiments (1687-88). To him are due some valuable discoveries in the manufacture of porcelain. His *Medicina Mentis* (1687) testifies to the philosophic tendency of his thought. In mathematics Tschirnhausen is known as the founder of the theory of catacaustics, or caustics by reflection. The original articles appeared in the *Acta Eruditorum* from 1682 to 1698. These publications contain also his work on equations and quadratics. In connection with the latter he invented the quadratrix (see Quadrature) known by his name. Consult Weissenborn, *Lebensbeschreibung des Tschirnhausen* (Eisenach, 1866).

TSCHISTOPOL, chĭs′tō-pōl. A district in the Government of Kazan, Eastern Russia (Map: Russia, H 3). Area, 3592 square miles. Population, in 1897, 307,224. The principal industries are the raising of cereals, flax, and hemp, and the curing and manufacture of leather. The district town Tschistopol, on the left bank of the Kama, 90 miles southeast of the city of Kazan, has three churches, a mosque, a gymnasium for girls, a bank, and various industrial establishments. There is considerable trade in cereals and wood products. Population, in 1897, 20,161.

TSCHUDI, cho͞o′dė, Ægidius or Gilg (1505-72). A Swiss chronicler, known as the father of Swiss history. He was born at Glarus, studied at the universities of Basel, Vienna, and Paris, and after holding several administrative offices entered the French army in 1536, serving till 1544. Once more he held office in various cantons and became, in 1558, chief magistrate of Glarus. He was a bitter opponent of the Reformation and sought to check the spread of the new doctrines by force of arms. This brought him great unpopularity and necessitated his temporary absence from the canton. During his last years he took little share in political affairs, and devoted his time to a study of the vast amount of historical materials which during many years he had gathered from public archives and the libraries of monasteries. His *Die uralt wahrhaftig alpisch Rhetia* was published at Basel in 1538, but his two great works, the *Schweizerchronik, or Chronicon Helveticum*, and the *Gallia Comata*, did not appear till more than one hundred and sixty years after the author's death. The *Schweizerchronik* covers the period 1100-1470, and is valuable for the large number of original documents incorporated in the text. Though uncritical, the *Schweizerchronik* has remained the great source for Swiss history. The *Gallia Comata* is in nature antiquarian, and was intended as an introduction to the *Chronicon Helveticum.*

TSCHUDI, CLARA (1857—). A Norwegian author, born at Tönsberg of Swiss parents. Intending to become a dramatic singer, she studied at Dresden and Berlin, but presently turned her attention to literature, and after publishing some works bearing on women's rights, such as *Kvindebevægelser* (1885) and *Tre nutiskvinder* (1887), became known through the historical portraits *Eugenie Keiserinde af Frankrig* (1889, 2d ed. 1897), *Keiserinde Augusta, Skildringer fra Hoflifet i Berlin* (1892), and especially through her *Marie Antoinettes Ungdom* (1894) and *Marie Antoinette och Revolutionen* (1895-96), which were followed by *Napoleon's Moder, Silhouetter,* and *Reiseminder og Skizzer* (all 1898).

TSCHUDI, FRIEDRICH VON (1820-86). A Swiss scholar, brother of Johann Jakob von Tschudi. He studied theology first at Schaffhausen, then at Basel, Bonn, and Berlin; and was made pastor of Lichtensteig in 1843, but resigned in 1847. He settled in Saint Gall, where he wrote, under the pseudonym of C. Weber, *Der Sonderbund und seine Auflösung* (1848), and under his own name several agricultural studies and the often reëdited and frequently translated *Das Tierleben der Alpenwelt* (1853). He held several official posts, and was distinguished for his services to education.

TSCHUDI, JOHANN JAKOB (1818-89). A Swiss naturalist, born at Glarus. He studied at Swiss, French, and German universities, and then traveled extensively in South America, visiting Peru (1838-43), and Brazil, the Plata States, Chile, and Bolivia (1857-59). From 1860 to 1862 he was Swiss Ambassador to Brazil, and in 1866 became diplomatic representative at the Court of Vienna, retiring in 1883. He published *System der Batrachier* (1838); *Untersuchungen über die Fauna Peruana* (1844-47); *Peru, Reiseskizzen* (1846); *Die Kechuasprache* (1853); *Antiguëdades peruanas* (1851), with Don Mariano de Rivero; *Reisen durch Südamerika* (1866-69); *Ollanta*, an ancient Peruvian drama out of the Quichua language (1875).

His son HUGO (1851—), born at Jakobshof, Austria, studied in Vienna jurisprudence and art-history, and after extensive travels through Europe became connected with the royal museums in Berlin, in 1884, and was appointed director of the National Gallery in 1896. Besides numerous important essays in various art-periodicals, he published, in collaboration with Pulszky, the text to *Die Landes-Gemäldegallerie in Budapest* (1883), and with Bode, *Beschreibung der Bildwerke der christlichen Epoche in den königlichen Museen zu Berlin* (1883). Since 1894 he has edited the *Repertorium für Kunstwissenschaft* (Stuttgart, 1875 et seq.), conjointly with Thode.

TSÊNG KI-TSEH, tsŭng′ kē̆′ tsĕh′ (1837-90). A Chinese statesman and diplomat, better known as the Marquis Tseng, born in Hu-nan. He served under his father as secretary, and in 1877 succeeded to the paternal title. In the following year he was appointed Minister to Great Britain and France. In 1880 he was further intrusted with an embassy at Saint Petersburg, and there negotiated the treaty by which Kulja was restored to China. In 1881 he was created vice-director of the Imperial Clan Court, and vice-president of the Board of War, and in 1885 arranged a convention with Great Britain in regard to the opium traffic, and was appointed assistant director of the newly established Admiralty Board. In 1886 he returned to Peking, became a member of the Tsung-li Yamen (q.v.), and in 1887 vice-president of the Board of Revenue. Two years later he was appointed director of the Tung Wen Kwan, or Peking School of Languages, and held this position until his death.

TSETSE-FLY (South African name). A biting fly (*Glossina morsitans*) of the family Muscidæ, related to the common stable fly (q.v.), which occurs in portions of Africa. The tsetse-fly bites all warm-blooded animals, but seems particularly attracted to cattle and horses. Its bite was formerly considered poisonous, and apparently produced death in beasts of burden coming from regions where the fly does not occur. The disease produced by the bite is called 'nagana.' Animals which have once recovered appear to be immune, or 'salted.' It has been determined that the bite of the tsetse-fly is not specifically poisonous, but that the insect acts as the carrier of a hæmatozoan parasite, taking it with the blood of diseased animals and carrying it to non-immunes. The tsetse-fly does not lay eggs, but multiplies by producing, one at a time, full-grown larvæ which immediately change to pupæ, just as do the so-called pupiparous Diptera. It was at one time supposed that the tsetse-fly would form a serious obstacle to the settlement of Africa by civilized races, but this is not the case. Only certain animals are affected by the disease, and the fly acts simply as a carrier; moreover, cattle became immune after residence in infected regions.

TSHI, tshē, or **CHWI.** A negro people on the African Gold Coast. See SUDAN.

TSI-NAN FU, or **TSE-NAN FOO,** chē̆′nän′-fōō′. A city of China, capital of the Province of Shan-tung. It lies in a large fertile plain 3½ miles south of the Yellow River, 245 southeast of Peking, and 400 west of Chi-fu, the principal treaty-port of the province (Map: China, E 4). The walls of the city proper have a circuit of 12 miles and are well built, but there is a large extramural population protected by a great encircling mud rampart. The principal streets are comparatively clean, and are lined with good shops. The city is noted especially for its silk brocades, its trade in precious stones, and the varied glass and other products of Po-shan-hien, the chief city of the 'black country' of Shan-tung. It has a drum-tower, a great examination hall capable of accommodating over 10,000 candidates, many fine temples, a Roman Catholic cathedral, besides the Yamens, or offices of the Governor and the high officers of the province. In the western part of the city are several geyser-like springs said to be connected with similar springs in Taishan (q.v.), some 60 miles distant. A few miles east of the city are several important iron mines. Population, 250,000, including 2000 Mohammedan families and the inhabitants of the suburbs. Tsi-nan is on the railway line projected by the Germans, and now under construction.

TS'ING-TU, or **JŌDŌ**. The Chinese and the Japanese names respectively of "The Land of Bliss," sometimes called the "Paradise of the West," presided over by Amitabha (or Amida) Buddha, re-birth in which is promised to all who put their faith in Amida. Life is there so long that it is practically eternal, and as it is a place of surpassing delight, free from all troubles, all pain and all misery, and can be reached without the performance of works of any kind, its attainment has become the aim of the adherents of the Ts'ing-tu sect of Buddhists in China, and the Jōdō and Shinshiu sects of Japan. Nirvana is too difficult. See *Sukhāvatī* and *Shinshiu;* and Edkins, *Chinese Buddhism* (London, 1880).

TSI-TSI-HAR, chē'chē'här'. The largest, the most northerly, and the most thinly populated of the three provinces of Manchuria (q.v.), known to the Chinese as Hei-lung-kiang. It is generally mountainous, covered with forests, and abounds in both large and small game—tigers, bears, leopards, deer of various kinds, antelopes, wild boars, wolves, foxes, badgers, wild cats, sables, and other fur-bearing animals, and hunting and trapping are extensively carried on. In the southwest are great prairies occupied by the Mongols, who maintain large herds of cattle, horses, etc., upon them. The climate is severe, the mercury falling in winter to 40° F. below zero, and lower. In summer it sometimes rises to 90° and 95°. Agriculture is chiefly confined to the river valleys, where are produced pulse, maize, millet, tobacco, wheat, sesamum, and the poppy. The drainage is to the north through the Sungari. Gold is found in the northwest, north, and east, and is mined at Moho. Much soda is produced and exported to China. The province is crossed by the Trans-Manchurian branch of the Russian Trans-Baikal Railway, which connects at Harbin with the Russian Railway that runs south-southwest to Port Arthur and Dalny. The population, estimated at 2,000,000, consists of Manchus, Korchin Mongols, Solons, Yakuts from Siberia, 6600 families of whom settled on the banks of the Nonni in 1687, and Chinese, chiefly from the northern provinces. The government is military, but there are two civil officials in as many localities where the population is largely Chinese. Besides the Bannermen a force of 7000 foreign-drilled Chinese troops is maintained. Tsi-tsi-har has long been a penal colony; and there is much brigandage. The capital, Tsi-tsi-har, on the Nonni, was built in 1692 in order to overawe the neighboring tribes. It is a few miles north of the Trans-Manchurian Railway, and is a dirty poorly built city with a population of between 30,000 and 40,000.

TSONG KHA-PA, tsông' k'hä'pä', **TSONG-K'A-PA**, or **TSOṄ-K'A-PA** (the man from Tsong-k'a); generally spoken of as Jé-rim-po-ch'é (c.1355-1419). A noted Tibetan reformer of Lamaism (q.v.). He was born at Tsong-k'a, in the Province of Amdo, near the Chinese frontier, and while still a child he was devoted by his parents to a religious life. At sixteen he began theological studies and a year later proceeded to Central Tibet. In Southern Tibet he spent eight years as a hermit and became convinced of the need of reform. Identifying himself with the *Kah-dam-pa*, 'The Sect bound by the Orders' (of the *Vinaya*, or 'Books of Discipline'), which had been purified and reformed by the Indian monk Atísha in the eleventh century, he reorganized it, and gave it the name of *Ge-lug-pa*, 'the Followers of the Virtuous Order.' In 1409 he built the great monastery of Gah-ldan ('Paradise'), 25 miles from Lhasa (q.v.), where he preached regularly, and by the time of his death his followers numbered over 30,000 in Lhasa alone. His reforms consisted in a stricter observance of the 235 rules of the *Vinaya*, or 'discipline,' a life of ethical purity, strict celibacy, simplicity in dress, the abandonment of the red robes which had become common, and the readoption of the yellow hat and the patched yellow robes worn and prescribed by the Buddha. He also reinstated the fortnightly 'disburdenment,' or rehearsal of the *Pratimōkṣa Sūtra* in regular assemblies of the Order at Lhasa, and restored the custom of retiring yearly for meditation. Tsong kha-pa was buried in the Gah-ldan, where his embalmed remains form the chief object of veneration.

TSO TSUNG-T'ANG, tsŏ' tsŭng't'-äng' (1812-85). A Chinese general and administrator. He was born at Hiang-yin, in Hu-nan, secured his second or 'master's' degree in 1832, and during the earlier years of the Taiping Rebellion served in Hu-nan and Hu-peh. In 1861 he had the command of the army operating in Che-kiang, and in the following year was also made Governor of that province. In 1863 he was also appointed Governor-General of the combined provinces of Che-kiang and Fu-kien, and by October, 1864, he had entirely recovered Che-kiang and was rewarded with an earldom. When the rebellion ended in 1865, he was also in command of Kiang-si and Kwang-tung. Appointed in 1866 Governor-General of Shen-si and Kan-su, then in the hands of the Mohammedan rebels, he first turned his attention to the Nien-fei insurgents, drove them from the neighborhood of Han-kow, entered Shen-si and defeated them there in 1867, and utterly routed them near Tien-tsin in August, 1868. He returned to Shen-si, pacified that province in 1869, drove the rebels beyond the Great Wall, and captured Su-chow in Kan-su in 1873. In 1875 he was appointed Imperial commissioner for Turkestan, and in April, 1876, he advanced with the main body of his army beyond the Great Wall, crossed the desert of Hami, and by October 10, 1877, had captured in succession Urumtsi, Tihua, Manas, Pidjan, Turfan, and Ku-che, north of the Tian-Shan; and by January 2, 1878, Harashar, Aksu, Kashgar, Yarkand, Yengi-shar, and Khotan—all in Eastern Turkestan, south of the Tian Shan—had been reconquered, and the campaign brought to a close. Tso was made a marquis and received many other honors. On his return to Peking in 1881 he became a member of the Tsung-li Yamen, and immediately succeeded in having all the Chinese students in the United States recalled. In the same year he was transferred to Nanking as Governor-General of Hu-nan and Hu-peh, whence in 1884, on the outbreak of French hostilities in connection with the Tongking affair, he was ordered to Fu-chow to direct the military operations, and died there in the following year.

TSOW-HIEN, tsou'hyĕn'. A small district or prefectural city of Shan-tung, China, noted as the birthplace of Mencius (q.v.) and the home of his lineal descendant and representative. It is about 15 miles east of Kiuh-fow (q.v.), the birthplace of Confucius, and in the midst of a region of great historic interest, hallowed in the eyes of the followers of these two early sages. There is a temple in honor of Mencius, and south of the city is his tomb, approached from the south by a fine avenue of cypress and yew.

TSU, tso͞o. The capital of the Prefecture of Miye, Central Hondo, Japan, situated on the eastern coast, 47 miles south-southwest of Nagoya (Map: Japan, E 6). It has a number of fine temples, of which that of Ko-no Amida attracts many pilgrims. Population, in 1898, 33,287.

TSUNG-LI YAMEN (or YAMŬN), tso͞ong' lĕ' yä'mŭn' (Chin., general managing office). The office or bureau through which the foreign Ministers in China until recently communicated with the throne and the Six Departments of Government. It was established in 1861, and was organized by Prince Kung (who became its first president) in conference with Sir Frederick Bruce, the first British Minister, and comprised between eight and twelve members. In 1901 it was superseded by the Wai Wu Pu, or 'Department of Foreign Affairs.'

TSURUGA, tso͞o-ro͞og'ȧ. A seaport of the Province of Echizen, Japan, about 50 miles north of Kioto, with which it is connected by rail (Map: Japan, E 6). It stands at the head of a deep bay, and is well situated for trade with Korea and Manchuria. Its harbor is protected by a breakwater and a lighthouse, and is the best on the northwest coast of the main island. Junk-building is the chief industry. It contains one of the oldest Shinto temples of the country. Population, about 12,000.

TSURUOKA, tso͞o'ro͞o-ō'kȧ, or **TSURUGAOKA**. A town in the Prefecture of Yamagata, Northern Hondo, Japan, 75 miles north-northeast of Niigata (Map: Japan, F 4). It was formerly a castle town. Population, in 1898, 20,461.

TSUSHIMA, tso͞o'shē-mȧ. An island of Japan, commanding the southern entrance to the Sea of Japan, less than 50 miles south of Korea, and separated from the island of Kiushiu by Krusenstern Channel (Map: Japan, A 6). It is penetrated by a deep inlet on the west, which at its narrowest is only 16 yards wide. At high water the narrow connecting spit is overflowed, forming two unequal islands. They are both mountainous, with peaks ranging from 1128 to 2130 feet above the level of the sea. Area, 262 square miles. The northern or larger island is indented with many fine bays, and the chief coast town is Waniura. Fishing is the chief industry and dried cuttlefish the chief export. The chief city, Idzunohara or Fuchiu, on the south island, has a population of about 10,000. Total population of the island, 38,636. Tsushima was held for centuries by the So family, who served as intermediaries in all relations between Japan and Korea, and Korean blood is very noticeable among the inhabitants.

TUA, to͞o'ȧ, TERESINA (1867—). An Italian violinist, born in Turin. Her principal teacher was Massart of the Paris Conservatory, under whom she made such rapid progress that in 1880 she won the first prize. She was uniformly successful from the beginning of her artistic career. In 1891 she retired from the concert platform owing to her marriage with Count Franchi-Verney della Valetta, but in the autumn of 1895 she again took up her concert work and made a very successful European tour.

TUAMOTU (to͞o'ȧ-mō'to͞o) **ISLANDS**. See LOW ARCHIPELAGO.

TUAREGS, to͞o-ä'rĕgz. Berber nomads in the Middle Sahara, numbering some 300,000, and perhaps descendants of the ancient Gætulians. (See GÆTULIA.) In various places they have mixed with negroes. They are tall, with slender figures and regular features, dark in complexion, with an occasional blond, and, owing to their frugal diet are long lived. The costume varies with location, but a common article of dress is the *litham*, a cloth wrapped about the face to protect the eyes and breathing organs from the dust of the desert. The Amoshagh or Noble Tuaregs wear a black litham and the Imghad or servile a white one, which gives rise to the epithets Black Tuaregs and White Tuaregs. Their weapons are a long, straight sword, a dagger, a spear six feet long, and occasionally a gun. They were monogamists until the Mohammedan conquest, when they began to vary somewhat in this respect. The women have great freedom among them, go unveiled, and have a part in public affairs. Consult: Duveyrier, *Les Touaregs du nord* (Paris, 1864); Bissuel, *Les Touaregs de l'ouest* (Algiers, 1888); Bernard, *Deux missions chez les Touareg* (ib., 1896); King, *Search for the Masked Touareks* (London, 1903); Masquerai, *Dictionnaire français-touareg* (Paris, 1893).

TUAT, to͞o-ät'. A group of oases in Algerian Sahara, North Africa, comprising the oases of Gurara and Tidikelt. It is a comparatively well-settled region and abounds in date palms. It is watered principally by the Wadi Saura or Mzaud and also by some subterranean watercourses. The largest lake is the Sebkha Gurara. The population of the region is estimated at 100,000, composed of Tuaregs, negroes, and Arabs. Tuat was formerly regarded as a dependency of Morocco, but with its occupation by French troops in 1900 has practically become a part of the French sphere of influence, and attempts are being made to extend the Algerian railway system into Tuat.

TUATARA, tōō'ȧ-tä'rȧ (Maori, spiny). A reptile of New Zealand (*Sphenodon* or *Hatteria punctatum*), which looks like a large stout lizard, but whose structure shows it to be the sole surviving representative of a primitive group, the Rhynchocephali, otherwise extinct in the Triassic age. Large males reach a length of 2½ feet, are dark olive green, and have a row of short yellowish, horn-sheathed spines along the vertebral line.· The skin is rather granular, except on the belly, where it is scaly. All its anatomy distinguishes this animal from lizards and allies it with the ancient Prosauria—the carpus, for example, has the primitive number of 10 bones, all separate; and there is an entire absence of external copulatory organs.

The tuataras were once numerous through New Zealand, but have been killed off by civilization and bush-fires, until now they inhabit only some small parts of the North Island. They dwell in burrows of their own digging, which they share with sundry petrels. They are fond of water, and are able to remain submerged for hours without breathing. During the day they sleep, but at night hunt for food, which consists of insects and worms in the interior and on the coast of small fishes, crustaceans, etc.; all food is taken alive. They move very slowly and lazily, but are fierce fighters when called upon to defend themselves. They lay in summer about ten eggs, elongated and hard-shelled, which are buried in warm sand and left to hatch, but this does not happen until about thirteen months later, although the embryos grow to nearly their full size in half that time or less, and then seem to æstivate. Consult: Gadow, *Amphibia and Reptiles* (London, 1901); Newman, *Transactions Zoölogical Society*, vol. xv. (ib., 1897); Howes, *Transactions New Zealand Institute*, vol. x. (Wellington, 1878); Van Haast, id., vol. xiv. (1881).

TUATHA-DE-DANAAN, tōō-ä'thȧ dȧ dȧ-nän' (Ir., Race or Tribe of Danaan). A prehistoric people of tall stature and blond type, who, according to the ancient annals of Ireland, invaded the island from the north several centuries before the Christian Era and by defeating the Firbolgs (q.v.) in the battle of Moytura became masters of the country until in turn overcome by the Milesians (q.v.). They were probably of Scandinavian origin.

TUBA (Lat., trumpet). A name given to the bass instruments of the saxhorn family, also called bombardons. Tubas are made in many keys, and, as they are played from the notes as written, they require no special transposition. They are the lowest of the brass instruments and their range is from $_{1}$B♭-f^{1}. Their tone is full and majestic; the most usual sizes are the bass tuba in B♭ and the contrabass tuba in $_{1}$B♭. Their introduction into the orchestra is due to Wagner, who obtained fine effects through them. The tuba has since then become a fixture in the orchestra, being used as the bass of the trombone choir. As such it has entirely superseded the ophicleide (q.v.). The instrument is built in two forms, oblong and round. See HELICON.

TUBAL-CAIN. According to the narrative in Genesis iv. 22, the son of Lamech and Zillah and the progenitor of all artificers in brass and iron.

TUBE-NOSE. A tube-nosed or harpy bat, a small East Indian fruit-bat of the genus Harpyia, remarkable for the fact that the nostrils are in the form of two extended and somewhat divergent tubes projecting above the upper lip. See Plate of BATS.

TUBER (Lat., swelling, tumor, knob on plants). A thickened and shortened branch from a subterranean stem. The leaves are usually reduced to minute scales with buds in the axils, forming in the potato the so-called 'eyes.' Its function is to act as a food reservoir, and to give rise directly to new plants. See STEM.

TUBERCLE. See TUBERCULOSIS; BACTERIA; DISEASE, GERM THEORY OF; SERUM THERAPY.

TUBERCULIN, KOCH'S LYMPH, or PARATOLOID. A glycerin extract of pure cultures of the Bacillus tuberculosis, first prepared in 1891 by Robert Koch (q.v.). It is a brownish, albuminoid liquid, neutral in reaction and soluble in water, and consists mainly of ptomaines of the bacillus, with coloring matters, extractives, and salts. When injected into the tissues of a healthy (non-tuberculous) person no reaction follows; but in the presence of tuberculosis, wherever situated, both a local and general febrile reaction is observed. The general symptoms are fever and chills; locally it affects the skin, which becomes red and swollen. A better serum was introduced by Koch in 1897, and efforts in the same direction were made by Klebs in Germany and Hunter in England, the earlier product having been found to contain substances very toxic to man. Of the curative value of tuberculin there appears to be some doubt. With the first serum treatment was tedious and prolonged, and the result uncertain. But it was hailed as a specific, and widely used by unskilled observers and on unsuitable cases. The results were disappointing and the remedy fell into disrepute. With the production of purer serums treatment has been more successful. Tuberculin is chiefly valuable as a diagnostic agent. It is largely used as a test for tuberculous cattle, to guard against the consumption of infected milk and meat. See TUBERCULOSIS.

TUBERCULOSIS (Neo-Lat., from Lat. *tuberculum*, little swelling, pimple, tubercle, diminutive of *tuber*, swelling, tumor, knob on plants), or CONSUMPTION. An infectious disease, caused by the Bacillus tuberculosis, characterized by the formation, in the tissues, of nodular bodies, called tubercles, and manifested symptomatically by fever, cough, dyspnœa, and progressive loss of strength. The disease is widespread and causes about one-seventh of the deaths throughout the world. Its clinical features were recognized many centuries ago, and Hippocrates and Galen described them very accurately; but it was not until the growth of anatomical study in the seventeenth and eighteenth centuries that the characteristic lesions (tubercles) were recognized and associated with the disease. Important additions to the pathological knowledge of tuberculosis were made by Bayle (1810) and to its physical diagnosis by Laennec (about 1834). Virchow's work in cellular pathology and finally Koch's brilliant discovery of the causative bacillus in 1882 settled all doubts as to the genesis and pathology of the disease, and since then nothing essential has been added to our knowledge concerning it.

Consumption prevails in all latitudes. Toward the poles and in very high altitudes the mortality is somewhat lower. No race is exempt, but negroes and Indians, and other races to whom the disease is comparatively new, are especially susceptible. In rare instances the disease is congenital, derived from the mother; there has been found no proof of paternal transmission either in man or animals. The great frequency in young infants of tuberculosis, whether of the lungs, meninges, or bones, is taken by many observers to prove that the virus can be transmitted. Heredity plays an important rôle in determining the disease in individuals. Children of tubercular parents are more liable than others to contract consumption, and hereditary predisposition can often be traced in a family for several generations. Two classes of individuals naturally predisposed toward consumption have long been recognized: the one tall, with straight limbs, regular and even beautiful features, dark hair, long eyelashes, thin and delicate skin; the other stunted, with coarse features, thick lips, light hair, sluggish action, and a tendency to enlargement of the lymph glands: A predisposition to tuberculosis is acquired under conditions that seriously lower vital resistance. Among those are overcrowding, deficient ventilation, poor food, prolonged and exhausting disease, pregnancy and lactation, and unhealthful occupations, such as glass-blowing, coal-mining, street-sweeping, exposure to cold and damp, and the excessive use of alcohol. The disease is most frequently acquired in early adult life (from twenty to thirty-five). The pulmonary complications following measles and whooping-cough in children are often forerunners of a tuberculous deposit in the lungs. The direct medium of contagion is the sputum of the tuberculous patient. The number of bacilli thrown off in this manner is enormous. By a patient moderately advanced in the disease Nuttall estimated there were expectorated in the twenty-four hours between two and four billions of bacilli. The sputum becomes dry and desiccated, the bacilli are distributed by the dust and obtain entrance to the body again through the respiratory tract. The flesh or milk of tuberculous cattle is capable of transmitting the disease both to man and to other animals. Many cases of intestinal and mesenteric tuberculosis in children are attributable to this source. Finally, infection can be brought about by direct inoculation. Demonstrators of morbid anatomy, butchers, and handlers of hides are subject to a local tuberculosis of the skin. Infection has taken place from circumcision, washing the clothes of phthisical patients, and through a cut from a broken sputum cup.

When the tubercle bacilli have once definitely invaded the lungs the disease runs its course with different degrees of rapidity. It may be fatal in three or four months, or ten to fifteen years may elapse between infection and death. During this time it may be quiescent for months or a year or more. Two types are usually recognized. The rapid form (galloping consumption) begins after a cold or exposure, with rapidly rising temperature, pain in the side, difficult breathing, rust-colored sputum, and consolidation of one or more lobes of a lung: in other words, like an attack of pneumonia. Instead, however, of improving at the end of the tenth day, the symptoms become graver, the fever continues high, the lung is rapidly softened and destroyed, and the patient dies in from three weeks to as many months. This form is always fatal. The second type, sometimes called chronic ulcerative phthisis, comes on more slowly and runs a longer course and includes the majority of cases of pulmonary tuberculosis. The disease begins with a slight but annoying and unproductive cough, chilly sensations, indigestion, loss of appetite, and gradually increasing weakness. As the trouble progresses, the cough becomes severe and constant, with yellow or whitish expectoration, containing usually multitudes of bacilli, and sometimes tinged with blood. Fever is higher in the afternoon and evening and the temperature rarely drops to normal. Night sweats, pains in the chest, steadily progressing weakness, dyspnœa, and wasting are now present. Occasionally quantities of blood are brought up (hemoptysis) during a paroxysm of coughing. It is bright red, frothy, and due to the ulceration of an artery of some size. The course is not always fatal; the disease may be arrested at any stage, and partial or complete healing take place, leaving scars or cavities in the lung. Improvement may be only temporary and the process start up again under favorable conditions. In fatal cases the last stage is marked by an exhausting diarrhœa, and swelling of the lower extremities. Death may take place suddenly from hemorrhage or gradually from exhaustion. Examination of the chest shows a deficient expansion of the ribs, rapid heart action, exaggerated voice sounds, irregular and high-pitched respiration, and different varieties of râles, depending on the stage of the morbid process. The prevention of tuberculosis is one of the most difficult problems with which the sanitarian has to grapple, the disease being so widely disseminated, and so insidious in its approaches. Efforts in this direction are mainly directed to destroying tuberculous cattle, segregation of phthisical individuals, and destruction of their sputum. Municipal ordinances against spitting in public places have been passed in many cities. In sanatoria patients use special receptacles for their sputum, which is thoroughly disinfected and burned. Boards of health in the larger cities are taking note of cases in private life and urging them to dispose of expectorated matters in a sanitary way.

Individuals predisposed to consumption should lead an exceptionally careful life in an equable climate and out of doors. Particular attention should be given to keeping the upper respiratory passages in a healthy condition and guarding against colds. Tuberculosis is a curable disease in its earlier stages. Spontaneous cure is an every-day phenomenon, and a large proportion of individuals dying of other diseases are found on autopsy to possess healed tubercular lesions in the lungs.

There is no successful specific treatment. Koch's tuberculin and its various modifications and the different antitoxins and antitubercle serums are being used, but are still in the experimental stage, and have to be administered with great circumspection. The treatment of consumption is in most cases best carried out in well-regulated sanatoria, where the patient's life and habits are under expert surveillance. The main objects in view are to place the sufferer in an environment favorable for the attainment of the best possible nutrition, to relieve the cough, sweats, and other wearing symptoms, and to give medicines that tend to check the progress of the disease. Fresh air is an essential consideration, whether treatment is carried on in sanatoria or at home. In general, a dry, germ-free bracing atmosphere, with an equable temperature and plenty of sunlight, where the patient can live practically out of doors, should be selected. There is no advantage in sending inevitably fatal cases away from home. Moderately advanced cases are as a rule more comfortable in warm climates like that of Florida and South California. The sleeping room of the consumptive should be well ventilated. Nutrition should be kept up to a high point by a plentiful supply of good, easily digested food, given at frequent intervals and carefully adapted to the patient's digestive powers. Milk, eggs, koumiss, or broths may be taken between meals, and when the stomach is not equal to solid food, a small amount of wine or whisky may be given at meal time to stimulate appetite and digestion. Life should be out of doors, but exercise should stop short of fatigue. The mental condition of the patient is of the utmost importance and cheerful surroundings and occupation should be chosen where possible.

Of the drugs that seem to have a definite curative value, the creosote group, cod-liver oil, and the hypophosphites are most valuable. Creosote, creosote carbonate, guaiacol and guaiacol carbonate, given in gradually increasing doses, are of use in all stages, but particularly in the active inflammatory stages. They diminish cough very markedly. Iodoform is sometimes given instead of creosote. Cod-liver oil improves the nutrition and is especially useful in what is illy termed the pretubercular stage. It acts better in children than in adults, and better in glandular and bone tuberculosis than in pulmonary. The emulsified fats or cream are good substitutes when cod-liver oil cannot be taken. Iron, arsenic, strychnine, and similar tonics are given according to indications. Besides general measures, special symptoms have to be watched and treated. Fever is combated by rest, fresh air, and small doses of quinine; severe cough by opiates; night sweats by belladonna, strychnine, and the mineral acids. Hemorrhage from the lungs calls for complete rest, large doses of opium or morphine, and suprarenal extract, with ice over the point of bleeding when it can be located. Vomiting, headache, indigestion, diarrhœa, etc., are all present and have to be managed as in other diseases.

Attempts to treat the disease locally by means of inhalation of antiseptic vapors, and ozonized air, and later by the X-ray and concentrated sunlight, have had a very small measure of success.

Tuberculosis attacks, primarily or secondarily, the lymph glands, bones, joints, intestines, peritoneum, brain, kidneys, bladder, spleen, liver, pleuræ, pericardium, heart, generative organs, and skin. Its manifestations in these situations are described in the articles on Scrofula; Adenitis; Pleurisy; Peritonitis; Meningitis; Bright's Disease; Bladder; Pericarditis; etc.

Pathology and Bacteriology. Tuberculosis is invariably due to the presence in the body and to the action upon the body tissues of a specific microörganism known as the tubercle bacillus.

The tubercle bacillus is a thin bacillus from three to four micromillimeters long, i.e. about one-half the diameter of a red blood cell. It is often slightly curved and there is a marked tendency of the bacilli to hang together, two often lying in the shape of a letter V. The bacillus grows on ordinary culture media at body temperature, but the growth is extremely slow. Thus, cultures on blood serum or on nutrient agar rarely show any signs of growth earlier than two weeks, when thin grayish dry scales begin to appear on the surface of the medium. Cultures grow best in the dark; in fact, the bacillus is killed by exposure for a few hours to the direct rays of the sun. From a pure culture successive cultures may be made indefinitely. Such cultures show a gradual loss of virulence, but no changes in growth characteristic. Inoculation of susceptible animals, such as the guinea-pig, with these cultures reproduces the disease. See Plate of Disease Germs.

The bacillus stains with difficulty with the aniline dyes, but when once stained retains the dye with great tenacity. It is upon this staining characteristic that our most important method for morphologically differentiating the tubercle bacillus depends. This consists in staining a suspected specimen with a strong solution of a red dye known as fuchsin, to which carbolic acid has been added to increase its penetrating powers. After staining, the specimen is washed in dilute acid, which extracts the stain from all other bacteria. The tubercle bacilli retain the red stain in spite of the action of the acid and may thus be differentiated. But three other bacilli resemble the tubercle bacillus in this staining reaction. They are the bacillus of leprosy, the smegma bacillus, and the so-called 'hay bacillus.' The first and last of these can usually be excluded on the ground of the impossibility of their being present. The smegma bacillus as a rule enters into consideration only in examining urine for the tubercle bacillus.

The changes which the tubercle bacillus causes in the body tissues are various. Thus it may stimulate the passage of serum and white blood cells from the blood vessels into the tissues, causing an exudative inflammation; or it may stimulate the production of new connective tissue, causing what is known as a productive inflammation; or its effects may be more severe and lead to death of tissue or necrotic inflammation. Any one of these effects may be produced separately, or, as is commonly the case, they are combined. The most distinctive feature of the action of the tubercle bacillus in the body is the production of what are known as tubercles or tubercle tissue. This tubercle tissue may occur either as the nodular tubercle or as diffuse tubercle tissue. In either case, according to Osler, "The 'tubercle' presents in its early formation nothing distinctive or peculiar either in its components or in their arrangement. Identical structures are produced by other parasites, such as the actionomycosis and the strongylus in the lungs of sheep." In the production of the 'tubercle' the bacilli, according to the extensive researches of Baumgarten, first cause a proliferation of the connective tissue elements with the production of epitheliod and giant cells. Following this is an inflammatory reaction with the exudation of serum and white blood cells. The 'tubercle,' which is now fully developed, may next undergo degenerative changes consisting of either caseation or sclerosis. Caseation begins in the centre of the growth and consists in a degeneration of the cells and their reduction to a homogeneous, structureless mass. Coincident with the caseation or following it is a sclerosis by which the tubercle is converted into a firm, hard substance composed of connective tissue rich in fibres. Osler describes very graphically these two processes as follows: "In all tubercles two processes go on: one—caseation—destructive and dangerous; and the other—sclerosis—conservative and healing. The ultimate result in a given case depends upon the capabilities of the body to restrict and limit the growth of the bacilli. There are tissue soils in which the bacilli are, in all probability, killed at once—the seed has fallen by the wayside. There are others in which a lodgment is gained and more or less damage done, but finally the day is with the conservative protecting forces—the seed has fallen upon stony ground. Thirdly, there are tissue-soils in which the bacilli grow luxuriantly, caseation and softening, not limitation and sclerosis, prevail and the day is with the invaders—the seed has fallen upon good ground."

Small tubercular nodules are called miliary tubercles. Seen with the naked eye the nodular tubercle is a small white, gray, or yellowish body, the smallest not visible without a miscroscope. Microscopically these tubercles show around their edges proliferated connective tissue and endothelial cells, with often some giant cells, while the centre is composed of tissue undergoing caseation or coagulation necrosis. Tubercle bacilli may be few or numerous.

Diffuse tubercle tissue usually results from a rather extensive local infection resulting in many small foci near together. From these tubercles start to grow, and these coalescing form considerable areas of tubercle tissue. In addition to the formation of tubercles the bacilli or the presence of the tubercle tissue may set up secondary inflammatory processes.

Suppuration in connection with tubercular inflammation frequently occurs. In the so-called 'cold abscess,' however, the fluid is not, properly speaking, pus, but the products of breaking down of the tubercles. The question as to whether the tubercle bacillus alone is capable of causing suppuration is still debated. It seems probable, however, that most cases of suppuration in tubercular conditions are due to what is known as 'mixed infection,' that is, the presence of pyogenic cocci with the tubercle bacilli.

Acute general miliary tuberculosis is characterized by a rapid development of tubercles, usually of small size, in many parts of the body at about the same time. The number of tubercles is frequently very large. One of the explanations offered for such sudden general diffusion of tubercles is that the infection is secondary to tubercles located in the walls of some of the small blood vessels or lymphatics.

Pulmonary tuberculosis, tuberculosis of the lungs, lung consumption, or, most commonly called simply 'consumption,' is a form of tubercular infection in which the only or the most prominent lesions are in the lungs. The bacilli usually gain entrance by being taken into the lungs with the inspired air. Less commonly infection of the lung may occur through bacteria being brought to them by means of the blood or lymph channels from tubercular foci in other parts of the body. Several factors must be considered as determining the character of the inflammation which the tubercle bacillus may induce in the lungs. Among these may be mentioned the number of bacilli introduced, their virulence, the manner in which they enter the lungs, whether in respiration or by means of the blood or lymph, the susceptibility of the individual, etc. As a result of variation in these factors we find a variation in the character of the inflammation set up. Thus there may result an exudative inflammation in which the air spaces of the lung and the smaller bronchi are filled with serum, leucocytes, fibrin, and cast-off epithelium. Such reaction is quite similar to that induced by the pneumococcus in pneumonia. On the other hand, instead of an exudative inflammation, the tubercle bacillus may bring about the production of new tissue, that is a productive inflammation. This new tissue is composed of small round cells and epithelioid cells, such as have been described above as tubercle tissue. In some cases there is death or necrosis of lung tissue with the formation of abscesses.

While it is common for these different lung-tissue reactions to tubercular infection to be associated, the predominance of one or another allows us to differentiate several quite distinct types of tuberculosis of the lungs.

Acute Miliary Tuberculosis of the Lungs. This occurs usually as a part of a general miliary tuberculosis, although it may be difficult to find lesions in other organs. The tubercles vary in size and are found in both lungs, lying in the lung tissue proper, in the walls of the vessels and bronchi, or in the connective-tissue septa. They may be quite evenly scattered or distributed in groups. The structure of the tubercles has been already described. The tubercles undergo coagulation necrosis, and there is apt to be some inflammatory reaction in the adjacent air spaces, as evidenced by more or less exudation. Some of these tubercles may be of considerable size, but many of them are often too small to be visible to the naked eye. These tubercles may go on to suppuration. They may coalesce to form larger tubercles. On the other hand, instead of breaking down, the tissue is sometimes converted into masses with or without calcified centres. These are known as 'healed tubercles,' and may or may not contain tubercle bacilli.

Tuberculous Broncho Pneumonia. In this form of tuberculous infection of the lungs, the tuberculous areas occur in the walls of the smaller bronchi and in the contiguous lung tissue. In its early stages the inflammation is mostly catarrhal, there being a more or less extensive exudate into the affected bronchi. As more and more bronchi are affected, there is frequently a coalescence of adjacent areas, with the formation of quite large masses of consolidation. These breaking down form cavities. The progress of the affection may be slow or rapid, and is one of the forms of pulmonary tuberculous popularly called 'phthisis.'

The term 'phthisis' is also applied to diffuse exudative tuberculous inflammation of the lungs, which may be either acute or chronic. In the acute form extensive areas of lung tissues may be involved, become consolidated, and, undergoing necrosis, result in the formation of large cavities. In the chronic form there is a slower involvement of the lung tissues, and there is apt to be more fibrous tissue, especially in the walls of cavities. These cavities may be small or large; are usually at first devoid of any wall, but soon acquire a wall of fibrous tissue, often lined with new tubercle tissue or with granulation tissue. This lining tissue often contains enormous numbers of tubercle bacilli, which are cast off in the sputum. It also furnishes a lodging place for pyogenic cocci, which cause suppuration of the membrane, and it is not at all improbable that these pyogenic cocci are very largely concerned in the formation of the cavities themselves. This secondary or concurrent infection, as it is called, is also largely responsible for the bronchitis and yellow or greenish expectoration which so usually accompanies phthisis. Blood vessels stretch across these cavities or lie exposed in their walls, to be broken either by an extension of the disease itself or from a strain too sudden for their weakened walls. In this way may be caused the hemorrhages so frequently associated with phthisis.

The most frequent site of tubercles in the adult lung is the apex, although the initial lesion may occur in any part of the organ. In children the bronchial lymph nodes are usually first affected. 'Healed tubercles' of the apex are found in a large proportion of autopsies.

Associated with the lesions in the lungs may be lesions in other parts of the body. These may be secondary to the pulmonary infection or the lung lesion may be secondary to other lesions. Acute or chronic inflammation of the pleura commonly accompanies the disease of the lung tissue proper. This inflammation may be simply exudative or may be tuberculous. Infection with the pyogenic cocci sometimes results in an empyæma (purulent pleurisy); or the opening up of bronchi or air spaces into the pleura may result in a pneumo-thorax.

TUBERCULOSIS OF SEROUS MEMBRANES. That of the pleura has been mentioned. Tubercular pleurisy may, however, occur independently of any lesion in the lung proper. Tubercular peritonitis may be primary, but is more frequently associated with tuberculous disease of some adjacent organs. Thus in women nearly half the cases are due to extension from the Fallopian tubes. In man the initial lesion may be in the seminal vesicles or prostate. It may be part of a general miliary tuberculosis. In the tubercular peritonitis of pulmonary phthisis the infection seems to reach the peritoneum through the intestines. In some cases minute tubercles are scattered over a part or all of the peritoneum and are usually accompanied by a serous or sero-fibrinous exudate. There may be larger areas of tubercular tissue which undergo necrosis. Secondary infection by the pyogenic cocci may occur, resulting in a purulent exudate. In what is known as chronic fibroid tuberculosis of the peritoneum there is little exudation, the tubercles are firm and pigmented, and the peritoneal surfaces matted together by fibrous adhesions. It is not uncommon to have tumor-like formations. These may be due to sacculated exudations, to matting together of omentum or intestinal coils, or to enlargement of mesenteric glands. Tubercular pericarditis may be primary or secondary, acute or chronic. In the acute miliary form the membrane is studded with tubercles and there is usually some sero-fibrinous exudate. In rare cases the exudate is large, Musser in one case reporting 34 ounces of fluid in the pericardial sac. In chronic cases the membrane is thickened, adherent, and usually shows several cheesy tubercular masses. The bronchial and mediastinal lymph nodes are regularly involved.

Tuberculosis occurs in bones, periosteum, and joints. In tuberculous osteitis the tubercles may be small and scattered, or less in number and of considerable size. Abscesses are sometimes formed. The adjacent joints are frequently involved. The spongy parts of the bone are more susceptible than the hard parts. The vertebræ, carpal and tarsal bones are most commonly affected. The chronic, purulent periostitis of poorly nourished children is frequently tubercular. For description of the lesion in tubercular arthritis, see SYNOVITIS.

GENITO-URINARY SYSTEM. Tuberculosis of the kidney may be primary, a part of a general miliary tuberculosis, or, as is most commonly the case, secondary to lesions in other organs. There may be small nodules in the kidney proper, or in the pelvis; or there may be quite large areas of tubercular tissue with necrosis. These may occur in only one kidney or in both kidneys. With much destruction of kidney tissue, cavities or cysts are formed, in some cases the kidney being almost wholly replaced by cysts of various size. There is apt to be thickening of the pelvis and tubercle tissue in its walls. Tuberculosis of the ureter and bladder is almost always secondary, especially to disease of the kidney pelvis. Small tubercles or patches of tubercle tissue are present in the ureter or bladder walls. Tuberculosis of the testes occurs as a primary lesion or, more frequently, as secondary to lesions elsewhere. In tuberculosis of the Fallopian tubes, the tubes are enlarged, their walls thickened, and the lumen usually filled with cheesy matter. Both tubes are frequently involved. Adhesions and the formation of abscesses are common results.

LIVER. Miliary tubercles of the liver are quite common as a part of a general miliary tuberculosis. Many of these tubercles are microscopic in size. Sometimes the tubercles are in among the liver cells, in other cases they develop in the walls of the smaller bile vessels, forming abscesses. Large tubercular patches having a diameter of an inch or more are sometimes found. In connection with the tubercular process there may be a marked increase in the connective tissue of the liver, constituting what is known as a tuberculous cirrhosis.

LIPS, MOUTH, ETC. In tuberculosis of the lips, which is a rare disease, there develops on the lip an extremely sensitive ulcer. This ulcer has much the appearance of an epithelioma or a chancre. Tubercular laryngitis is most frequently secondary to tuberculosis of the lungs. Miliary tubercles form in the submucosa and are accompanied by a catarrhal inflammation of the mucous membrane. With necrosis of the tubercles, ulcers are formed. These ulcers often run together, involve adjacent parts, and determine extensive destruction of tissue. Tuberculosis of the tongue is marked by the appearance of small nodules on the upper surface or edge of the organ. These open on the surface and become ulcers. It is a rare condition except when associated with tuberculosis of other parts. Tuberculosis also occurs in the palate, tonsils, pharynx, œsophagus, and stomach. The lesions are similar to those described in other mucous membranes, that is, the formation of nodules, a catarrhal inflammation, and necrosis with the formation of ulcers.

INTESTINES. In tuberculosis of the intestines there is involvement of Peyer's patches and of the solitary lymph nodules as well as ulcers of the mucous membrane between the patches. As a primary lesion it is extremely rare in adults, much less rare in children, where there is apt to be involvement of the mesenteric glands or a tubercular peritonitis. In the secondary form of the disease in adults the lungs are the usual seat of the primary lesion. The ulcers occur chiefly in the colon, cæcum, and ileum. They may be very extensive, affecting the greater portion of the mucous membrane of both large and small intestines. The ulcers are irregular in shape, rough in outline, their long axes transverse to the lumen of the gut. They usually involve not only the mucous membrane, but also the submucosa and muscular coats. They rarely perforate. With healing of the ulcers, extensive scar tissues may form, so contracting the bowel as to cause stenosis. Not uncommonly tubercles are present on the peritoneum adjacent to the intestinal ulcers. Tuberculosis of the rectum is quite frequently associated with fistula, the fistula being of the nature of a tuberculous ulcer.

In tuberculosis of the breast, nodules form in the gland. These may become necrotic, communicate by fistulous openings with the surface, and form ulcers. In the majority of cases the axillary glands are involved.

Tubercular lesions may occur in the brain as part of a general miliary tuberculosis. In such cases it affects the meninges, causing a tuberculous meningitis, usually associated with an increase in the fluid within the ventricles (acute hydrocephalus). In chronic tuberculosis of the brain the lesion is a meningo-encephalitis, the tubercles affecting both meninges and brain tissue proper. The lesion is usually localized and there are in most cases several nodules. These nodules vary in size from a quarter of an inch to nearly an inch in diameter, sometimes being even larger. The nodules on section present a grayish yellow appearance, a necrotic sometimes almost fluid centre, and are surrounded by an area of clear soft tissue. The nodules are usually attached to the pia mater and extend from the surface into the brain. The nodules may interfere with cerebral circulation, causing softening, or sinus thrombosis, or may incite an acute meningitis. The pia is apt to be thickened and adherent to the brain surface. Instead of several nodules there may be one large solitary tubercle. Lesions quite similar to those described for the brain may occur in the cord either with or without brain lesions. See BACTERIA; DISEASE, GERM THEORY OF.

Consult: Latham, *Pulmonary Consumption* (London, 1903); Osler, *Practice of Medicine* (New York, 1901); Ziegler, *Pathological Anatomy* (Eng. trans., ib., 1887); Klebs, *Tuberculose* (Hamburg, 1894); and monographs by Virchow (1863-65) and Koch (1882-90).

TUBERCULOSIS (in animals). Viewing the evidence at hand, investigators have attributed the various forms of tuberculosis in animals to Bacillus tuberculosis. Birds are commonly supposed to be affected by a different form, but the differences observed are also considered to be due to differences in the anatomy and resisting power of different animals. Horses, sheep, goats, dogs, and cats are rarely affected; poultry and parrots frequently; cattle and hogs most commonly. European and American statistics from tuberculin tests and from meat inspection indicate that from 10 to 50 per cent. of the cattle examined are affected. Tubercles may be found locally or generally distributed in the respiratory, alimentary, and lymphatic structures and in the bones of the animal examined. The popular notion that tuberculosis in man is caused by the consumption of tuberculous meat and milk is without sure proof, and obviously experiments cannot be made to determine this point. Since, however, such food products are feared, and since they suggest uncleanness and negligence on the part of both producer and consumer, they should be avoided. Governmental inspection of dairies and meat has wrought great improvements in the sanitary conditions of stock and dairy farms, and methods of handling milk and meat, and has educated the public to demand pure animal products. The danger is far less than is generally supposed, since experiments indicate that milk from cows suspected to be tuberculous may be fed to calves without danger, and when pasteurized it may be used as human food with no untoward results.

For the detection of incipient cases of tuberculosis in cattle tuberculin is usually employed. This substance contains what is called the toxin produced during the growth of the bacillus, but does not contain the living organism. When injected into healthy cattle tuberculin produces no reaction, but in affected cattle an elevation of from 1½° to 3° or more of the body temperature and a slight swelling at the point of injection are looked for. Animals which show these symptoms are considered tuberculous and are separated from the rest of the herd. If they are valuable they may be used for breeding purposes, since the progeny rarely exhibit tuberculous symptoms. The calves are usually separated from their mothers very soon after birth. No reliable medical treatment has been discovered, though repeated injections of tuberculin have in some instances appeared to be slightly curative. Some cases recover spontaneously. Preventive measures are cleanliness, airy quarters, pure water and food, and free range upon good, well-managed pastures.

TUBEROSE (from Lat. *tuberosa*, fem. sg. of *tuberosus*, tuberous, from *tuber*, swelling, tumor, knob on plants; associated by popular etymology with Eng. *tube rose*), *Polianthes tuberosa.* The only species of its genus, which belongs to the natural order Amaryllidaceæ. The plant, which is a native of Mexico, has a tall stem with long leaves at the base and shorter ones toward the top of the several-flowered spike of very fragrant white blossoms. The plant grows well in mild climates, but it bears the open air in northern countries only during the summer. Near Grasse, in Southern France, the tuberose is largely grown as a source of perfume. The popularity of a double-flowered form has suffered from its too extensive use in funeral designs, etc. In outdoor culture in mild climates the plants are not disturbed during the winter, but in northern climates the tuberous rootstocks are taken up and stored in a dry, frost-proof place. In the colder regions where the bulbs fail to mature completely they are imported usually toward the end of the year, planted in pots, and given bottom heat. When danger of frost has passed they are set in light, moist, and rich soil and kept well supplied with water.

TUBEROSE (*Polianthes tuberosa*).

TUBES. See PIPES.

TUBES OF FORCE. See ELECTRICITY.

TUBES OF INDUCTION, TUBES OF MAGNETIC FORCE. See MAGNETISM.

TUBE-WEAVER. Any one of the tube-building spiders of the families Drassidæ and Clubionidæ. They are, as a rule, dark-colored spiders, which spin no web, but wander about at night in search of prey and hide during the daytime. They make silken tubes in which they hide in the winter and while molting or laying eggs. See SPIDER.

TUBIGÓN, to͞o'bē̂-gōn'. A town of Bohol, Philippines, situated about 28 miles from Tagbilaran (Map: Philippine Islands, H 10). Population, in 1887, 11,616; now 15,850.

TÜBINGEN, tụ'bĭng-*en*. A town of Württemberg, Germany, crowning a hill on the Upper Neckar, 18 miles south-southwest of Stuttgart, on the edge of the Black Forest (Map: Germany, C 4). It owes its celebrity chiefly to the ancient university. (See TÜBINGEN, UNIVERSITY OF.) The antique houses and narrow streets of the old part of the town give it a quaint appearance. Saint George's Church (*Stiftskirche*) contains a beautiful choir, and the new Catholic church is a superb edifice. The town hall is an interesting timber-built structure, recently restored. The poet Uhland, who was born in Tübingen, is commemorated by a fine statue. On a hill above the city stands the interesting Renaissance castle, Hohentübingen, completed in 1540. It affords a magnificent view. The university library and observatory are here. North of Tübingen is the Cistercian monastery of Bebenhausen (1185), an exceptionally fine example of Gothic architecture. It has beautiful cloisters and an art collection. The Protestant seminary, dating from 1536, became noted under Baur, who founded the Tübingen school of theology. (See TÜBINGEN SCHOOL.) There is also a Catholic seminary. Both of these institutions possess good libraries. The town has a surgical clinic, a woman's hospital, and a hospital for the insane. The manufacture of surgical and scientific instruments, book printing, and the cultivation of hops and the vine are the leading industries. Population, in 1900, 15,338, nearly all Protestants.

Consult: Eifert, *Geschichte der Stadt Tübingen* (Tübingen, 1849); Fink, *Tübingen* (Zurich, 1891).

TÜBINGEN, UNIVERSITY OF. A German university, founded in 1477 by Count Eberhard im Bart of Württemberg. It was organized with the usual four faculties. Reuchlin, Melanchthon, and Heinrich Bebel taught there at various times. Under Dukes Ulrich and Christopher, the university took an active part in the Reformation. What made the university famous in its early days and since is the Protestant seminary established in 1536 for the education of evangelical ministers, which is directly under the Minister of Public Worship and Education. It thus became the leading theological university in Germany. The institution maintained a steady growth until the establishment of the Karlsschule by Duke Charles Eugene, when it suffered a temporary decline. King Frederick took away from the university in 1811 most of its rights and privileges. In 1817 the Catholic university founded at Ellwangen in 1812 was united with Tübingen, and a Catholic theological faculty was added; at the same time the faculty of political science was created, and in 1863 was added the natural science faculty. In the nineteenth century the institution experienced a vigorous growth, due chiefly to the great theologians, such as Baur, the head of the Tübingen school of criticism, Strauss, and many others. Since 1832 the whole university has practically been rebuilt. In 1902 the university consisted of the following faculties: (1) Evangelical-theological; (2) Catholic-theological; (3) law; (4) medicine; (5) natural science; (6) philosophy; (7) political science. It includes numerous seminaries, laboratories, and clinics. The library now contains over 390,000 volumes and nearly 3800 manuscripts. The attendance in 1902 was 1524. Consult Klüpfel, *Die Universität Tübingen in ihrer Vergangenheit und Gegenwart* (Leipzig, 1877).

TÜBINGEN SCHOOL. A term applied to a modern theological movement which had its origin in the teachings of Ferdinand Christian

Baur (q.v.), of the University of Tübingen. Though he was unwilling to admit that he was a disciple of Hegel, Baur's distinctive and guiding principles were those of the Hegelian philosophy. It was his aim to reconstruct the history of early Christianity so that it would be seen to be in harmony with the laws which everywhere govern historical evolution. He began with the Apostolic age, a method which has since won universal approval. In 1831 he published his essay *Die Christuspartei in der korinthischen Gemeinde, der Gegensatz des paulinischen und petrinischen Christentums in der ältesten Kirche, der Apostel Petrus in Rom.* In this were foreshadowed all his later critical results. His position was that the early Apostolic Church was split into two hostile factions, Pauline (Gentile) and Petrine (Jewish), between whom there was a bitter conflict. Although an element of Jewish Christianity remained unreconciled to the last (the Ebionites), the Pauline party (mainly after Paul's death) made concessions, and thus brought about a reconciliation which resulted in the establishment of the Old Catholic Church. These views were elaborated and fully stated in the works: *Ueber die sogenannten Pastoralbriefe* (1835, the same year in which Strauss's *Leben Jesu* appeared); *Paulus der Apostel Jesu Christi, sein Leben und Wirken, seine Briefe und seine Lehre* (1845, 2d ed. 1866); *Die kanonischen Evangelien* (1847); and *Das Christentum und die christliche Kirche der drei ersten Jahrhunderte* (1853). Baur's position led him to attempt a thorough reconstruction of the history of the origin of the New Testament literature. His theory demanded that the New Testament books in which the evidences of the conflict were most patent, or in which either of the two conflicting views was positively stated, should be considered earliest in date. Therefore, Paul's four genuine letters (Rom., I. and II. Cor., and Gal.) of the Pauline wing, and the Apocalypse by John with the early Hebrew form of the Gospel of Matthew, of the Petrine or Jewish party, were named as the earliest productions of the Apostolic Church. The other books were dated according to the exigencies of the general theory—Mark, as altogether neutral, being set down as the latest of the Synoptics, and with our Greek Matthew, Luke, Acts, John, and the Pastoral Epistles placed very late, altogether outside of the Apostolic age. In Acts, in particular, the desire to reconcile the two parties, even at the expense of genuine Paulinism, was said to be quite manifest. This criticism, based on the supposed tendency (*Tendenz*) of the New Testament documents and now known as 'tendency criticism' (*Tendenzkritik*), was thoroughly under the control of the Hegelian conception ("thesis, antithesis and synthesis") of history. Baur's theory, practically unaltered, was advocated with great brilliancy by E. Zeller in the organ of the school, the *Theologische Jahrbücher* (from 1842 on), and in *Die Apostelgeschichte nach ihrem Inhalt und Ursprung* (1856), by A. Schwegler in *Das nachapostolische Zeitalter* (1846), and by Karl Planck and Karl Köstlin in various publications. Others of the school differed from the master in important details, but fully accepted the main principle. Of these Volkmar in Switzerland, Hilgenfeld and Holsten in Germany, Scholten in Holland, S. Davidson in England, may be cited as representatives. David Strauss is also often spoken of as a representative of the Tübingen school. This, however, is not strictly correct. Strauss was indeed influenced by Baur in his early years, but that was before Baur himself had fully formulated his views.

The most important defection in the ranks of Baur's disciples was that of Albrecht Ritschl (q.v.), who in the second edition of his *Die Entstehung der altkatholischen Kirche* (1857) asserted that it was a mistake to explain the origin of Old Catholic Christianity as a union of early Jewish or Petrine Christianity and modified Paulinism. His trenchant criticism and that of others gradually showed the baselessness of many of Baur's positions. At his death in 1858 it was already evident that the dates he assigned to New Testament books could not longer be defended. The whole theory, in fact, as originally formulated by Baur, has no advocates at the present time, although many prominent scholars of to-day, as Hilgenfeld, Hausrath, O. Pfleiderer, H. J. Holtzmann, Schmiedel, while independent of any formal adhesion to Baur's theory, are at one with the great Tübingen professor on important points.

LITERATURE. Besides the writings noted above, see the estimates by Reuss, *Geschichte der heiligen Schriften des Neuen Testaments* (2d ed., Brunswick, 1890); Dorner, *Geschichte der protestantischen Theologie* (Munich, 1867); R. M. Mackay, *The Tübingen School and Its Adherents* (London, 1863); Pfleiderer, *Development of Theology in Germany Since Kant* (ib., 1890).

TUBULAR BRIDGE. See BRIDGE.

TUBULIFLORÆ. A suborder of composite plants. It consists of eleven tubes, the members of which are characterized by having all their perfect flowers tubular; the ray flowers, when such are present, are either neutral or pistillate. Among the genera are Eupatorium, Aster, Inula, Helianthus, Veronica, Helenium, Anthemis, and Calendula.

TUBURÁN, tōō′bōō-rän′. A town of Cebú, Philippines, situated on the coast, 51 miles southwest of Cebú (Map: Philippine Islands, H 9). Population, 10,760.

TUBUS. A Nigritian people. See TIBBUS.

TUCANO, tōō-kä′nō. A tribe residing upon the Uaupés River, on the Brazil-Colombia border, and supposed to be remotely of Arawakan stock (q.v.). They take their name from the toucan bird. They tattoo three lines upon each cheek, build circular houses of poles covered with palm leaves, are good canoemen, and are noted for their skill with the blowgun.

TUCK, FRIAR. The jolly chaplain and boon companion of Robin Hood and his men. He figures in the Robin Hood legends and appears in Scott's *Ivanhoe* as the Holy Clerk of Copmanhurst.

TUCK′ER, ABRAHAM (1705-74). An English moralist, born in London. He studied at Merton College, Oxford, and was entered at the Inner Temple, but was never called to the bar. Inheriting a large fortune from his father, he purchased in 1727 Betchworth Castle and estate, near Dorking, in Surrey. During his last years he was blind. Tucker's great work is entitled *The Light of*

Nature Pursued (1768-78). It was begun in 1756, and formed the chief literary occupation of the rest of his life. It extended to seven volumes, only four of which were published in the author's lifetime, under the pseudonym of Edward Search. It is not a systematic treatise, but consists of a series of disquisitions on metaphysics, theology, and morals, all of which exhibit remarkable originality, simplicity of humor, and ingenuity of illustration. Consult his *Works*, edited with a *Life* by H. Mildmay (London, 1805; several times reprinted).

TUCKER, George (1775-1861). An American historian and miscellaneous writer, born in Bermuda. He was graduated at William and Mary College in 1797, studied law, practiced at Lynchburg, was a member of the Virginia Legislature, and of Congress (1819-25), gained distinction as a debater and constitutional lawyer, and was (1825-45) professor of moral philosophy and political economy in the University of Virginia. He was a frequent contributor to political periodicals, and published, among many other works, *Letters on the Conspiracy of Slaves in Virginia* (1800); *The Valley of the Shenandoah* (1824), a novel; *A Voyage to the Moon*, a satirical romance (1827); *Principles of Rent, Wages, and Profits* (1837); *Life of Thomas Jefferson* (1837); *The Theory of Money and Banks Investigated* (1839); *Progress of the United States in Population and Wealth in Fifty Years* (1843); *History of the United States* (to 1841, 1856-58); *Banks or No Banks* (1857); and *Essays, Moral and Philosophical* (1860). His *History of the United States* is still a work of some importance.

TUCKER, John Randolph (1812-83). An American naval officer, born at Alexandria, Va. He entered the United States Navy as a midshipman in 1826, and in 1855 reached the rank of commodore. After Virginia passed her secession ordinance in 1861, Tucker resigned his commission and entered the Confederate service. In command of the *Patrick Henry*, he took part in the Hampton Roads engagements, receiving command of the wooden fleet after the *Monitor-Merrimac* battle, and assisted in the repulse of the Union squadron at Drury's Bluff. He was promoted captain in May, 1863, commanded at Charleston and then at Drury's Bluff, and after the evacuation of Richmond was attached to Lee's retreating army. In 1866 Tucker became commander of the Peruvian Navy, with the rank of rear-admiral, and he commanded the naval forces of Peru and Chile in their war with Spain. Subsequently he explored parts of the Upper Amazon region. He died at Petersburg, Va.

TUCKER, Josiah (1712-99). An English economist and divine, the son of a Welsh farmer. He was educated at Saint John's College, where he graduated in 1736. He became rector of Saint Stephen's, Bristol (1749), and dean of Gloucester (1758). In 1755 he received from Oxford the degree of D.D. Tucker was a thorough student, and careful writer on political economy and subjects pertaining to religion. He also published several pamphlets in the beginning of the contest between the English Government and its American colonies in favor of separation. As an economist he has some claims as a forerunner of Adam Smith (q.v.), but Tucker elaborated no system.

TUCKER, Nathaniel Beverley (1784-1851). An American lawyer. He was born at Williamsburg, Va.; was educated at William and Mary College; studied law and practiced in Virginia until 1815, when he removed to Missouri. He was a judge in the Circuit Court until 1830; professor of law in William and Mary College 1834-51. He published works on *Pleading* and *Constitutional Law* and several practical essays. His best literary effort was his novel, *The Partisan Leader, a Tale of the Future* (1836). He also wrote *Balcombe* (1836).

TUCKER, St. George (1752-1828). An American lawyer, born in Bermuda. He came early to Virginia and was educated at William and Mary College, after which he was called to the bar. During the Revolutionary War he commanded a regiment at Yorktown, where he was badly wounded. In 1778 he married the mother of the afterwards celebrated John Randolph of Roanoke. He served in the Legislature, but won his chief distinction as professor of law in William and Mary, and as presiding judge of the Virginia Court of Appeals, and of the United States District Court. He is still remembered for a scholarly edition of Blackstone's *Commentaries* (1803) and for a single lyric beginning "Days of my youth." He also published a *Dissertation on Slavery* and other politico-legal works, and composed poems and dramas.

TUCKER, Samuel (1747-1833). An American naval officer, born at Marblehead, Mass. The son of a ship-master, he ran off to sea when only eleven years old, became commander of a merchantman in 1768, and in January, 1776, was commissioned captain in the American navy. In command of the *Franklin* and later of the *Hancock*, he captured more than thirty British vessels, and in March, 1777, was transferred to the frigate *Boston*, which (in February, 1778) carried John Adams as commissioner to France. After taking many prizes, he was forced to surrender at Charleston (May, 1780), but was soon exchanged, and as captain of the *Thorn* secured many prizes. In July, 1781, he was again captured and released on parole. He removed to the site of the present Bremen, Me., in 1792, and in 1813 captured a British vessel which had been threatening the neighboring coast. Subsequently he served in the Massachusetts Legislature (1814-18), helped frame the Maine Constitution (1819), and sat in the Maine Legislature (1820-21). Consult Sheppard, *Life of Commodore Samuel Tucker* (Boston, 1868).

TUCK'ERMAN, Bayard (1855—). An American author, lecturer on English literature in Princeton University. He was born in New York. He graduated from Harvard in 1878, completed his studies in Paris, and became favorably known through the following publications: *History of English Prose Fiction* (1882); *Life of General La Fayette* (1889); *Diary of Philip Hone* (1889); *Peter Stuyvesant* (1893); *William Jay and the Abolition of Slavery* (1893); and *Philip Schuyler, Major-General in the American Revolution* (1903).

TUCKERMAN, Edward (1817-86). An American botanist, born in Boston. He studied at Union College and Harvard University, frequenting in the latter the law and divinity schools, was in Europe in 1841-42 given to the study of botany, and completed his courses at Harvard in 1847 and 1852. From 1854 to 1873 lecturer on history at Amherst, he was appointed professor of botany there in 1858, and held this chair to the end of his life. Although devoted to a variety of botanical studies, he made a specialty of lichenology, and besides numerous contributions to various journals on this subject, published *A Synopsis of the Lichens of New England*, etc. (1848); *Genera Lichenum: an Arrangement of the North American Lichens* (1872); *A Synopsis of the North American Lichens*, part i. (1882); part ii. was edited, with an appendix, by Henry Willey (1888). His *Lichenes Americæ Septentrionales Exsiccati* (1847-55) contains 150 species. From 1834 to 1841 he contributed to the New York *Churchman* many articles on historical, biographical, and theological topics under the titles *Notitia Literaria* and *Adversaria*. Consult the *Memoir* by Farlow (Washington, 1887).

TUCKERMAN, HENRY THEODORE (1813-71). An American critic and essayist, born in Boston and prominent in the literary life of New York City after 1845. The more important of his numerous publications were: *The Italian Sketchbook* (1835); *Isabel, or Sicily: a Pilgrimage* (1839)—each the outcome of a residence in Italy; two volumes of verse, *Poems* (1851) and *A Sheaf of Verse* (1864); *Artist Life, or Sketches of American Painters* (1847); *Characteristics of Literature* (1849, 2d series 1851); *America and Her Commentators* (1864); *Thoughts on the Poets* (1864); and *Book of the Artists* (1867), a study of the rise and progress of art in America. He wrote a *Life* of J. P. Kennedy (1871), and was a useful writer in his day.

TUCKERMAN, JOSEPH (1778-1840). An American clergyman and philanthropist. He was born in Boston; graduated at Harvard College, 1798; studied theology, and became a Unitarian pastor in Chelsea in 1801. In 1826 he was appointed by the American Unitarian Association minister at large, devoting himself to city mission work. He is best known as one of the founders of the first sailors' aid societies in the country, and as one of the pioneers in the scientific direction of philanthropy. He wrote much in behalf of his projects. Consult the collection of his writings under the caption *On the Elevation of the Poor* (Boston, 1874) and his *Life* by W. E. Channing (Boston, 1841), and by Miss May Carpenter (London, 1849).

TUCKERMAN, SAMUEL PARKMAN (1819-90). An American organist, church composer, and musical lecturer. He studied the organ in Boston under Zeuner and became organist and choirmaster of Saint Paul's Church of that city in 1840. Nine years later he went to England and studied cathedral and church music generally, and at the same time lectured on musical subjects. He returned to Boston and took up church work and lectured on early cathedral and church music. His compositions are principally services, hymns, and anthems for the Episcopal Church service. He also edited collections: *The Episcopal Harp; National Lyre; Cathedral Chants* (1858); *Trinity Collection of Church Music* (1864).

TUCO-TUCO. A small burrowing rat-like rodent, a 'spiny rat' of the genus Ctenomys, several species of which are so called in imitation of their loud, treble call.

TUC'SON. The largest city of Arizona, and the county seat of Pima County, 130 miles southeast of Phœnix; on the Santa Cruz River, and on the Southern Pacific Railroad (Map: Arizona, C 3). It is the seat of the University of Arizona, opened in 1891, and of Saint Joseph's Academy. The public library has about 3500 volumes. Cattle-raising and farming are the leading industries of the surrounding district, which also has considerable mineral wealth. The industrial establishments of the city are for the most part connected with the mining industry. The water-works are owned by the municipality. Population, in 1890, 5150; in 1900, 7531.

Tucson was first permanently settled as a presidio by the Spaniards about 1776, though there had been previously a small Indian village, or rancheria (abandoned in 1763), under the control of the Spanish authorities. It lies within the territory obtained for the United States by the 'Gadsden Purchase' of 1853. It was the capital of Arizona Territory from 1867 to 1877, and was incorporated in 1877 and reincorporated in 1883. There seems to be no foundation for the belief that Tucson was founded by the Spaniards in 1560, and thus antedates Saint Augustine. Consult Bancroft, *History of New Mexico and Arizona* (San Francisco, 1880).

TUCUMÁN, tōō'kōō-män'. The smallest and most densely populated province of Argentina, bounded by the Province of Salta on the north, Santiago del Estero on the east, and Catamarca on the south and west (Map: Argentina, D 9). Area, 8926 square miles. The eastern portion is rolling, but the western portion becomes quite mountainous. The mountains, offshoots of the Andes, afford extensive forests in the valleys and some mines of gold, silver, and copper, but these are not extensively worked. Sugar and rum are the chief products, but cereals, rice, tobacco, and fruits are raised. The soil generally is fertile, but in some portions use must be made of irrigation. The population, which is largely mestizo, in 1895 numbered 215,742. Tucumán (q.v.) is the capital. Tucumán was originally a portion of the dominions of the Incas. After the conquest the *Gobernación* of Tucumán included many of the surrounding provinces and was first subject to the *Audiencia* of Charcas, and after 1776 to the Viceroyalty of La Plata.

TUCUMÁN, or SAN MÍGUEL DE TUCUMÁN. A city of Argentina, capital of the Province of Tucumán, 690 miles northwest of Buenos Ayres, on a plateau to the right of the River Tala or Sali (Map: Argentina, D 9). It is a regularly built city, but with narrow streets. The cathedral is modern. The city was founded in 1565. Here, July 9, 1816, the representatives of the Plata Provinces signed the declaration of independence from Spain. The population in 1895 was 34,305; in 1901 (estimated), 50,000.

TUCUMÁ PALM. See ASTROCARYUM.

TUCUNA, tōō-kōō'nȧ. A wild tribe of the Upper Amazon. See TICUNA.

TUCUXI, tōō-kōō'hē (South American name). A South American dolphin (*Sotalia Guianensis*), very abundant in the Bay of Rio Janeiro, where the natives regard it as able to bring ashore drowned persons, and have other fanciful ideas in regard to it. The genus Sotalia is represented by other species in various parts of the world, some of which live wholly in fresh water. Consult Beddard, *Book of Whales* (London, 1900).

TUDELA, tōō-dā'lȧ. A town of the Province of Navarre, Spain, on the left bank of the Ebro, here crossed by a bridge of nineteen arches. It is 47 miles by rail from Saragossa (Map: Spain, E 1). Most of its important public buildings are modern, but it is especially famous for the romanesque Colegiata (formerly the cathedral), which is regarded as one of the finest churches in Europe. The chief industries are the sawing of lumber, the manufacture of licorice, cloth, silk goods, earthenware, and the production of oil and wine. The best wine of Navarre, resembling Burgundy, is produced in this vicinity. The population in 1900 was 8996. Tudela fell into the hands of the Moors in the eighth century, but was retaken by Alfonso I. of Aragon in 1114. In 1808 the Spanish forces under Castaños and Palafox were here twice defeated by the French under Lannes.

TUDELA, Benjamin of. A mediæval traveler. See Benjamin of Tudela.

TU'DOR. The family name of the dynasty which occupied the throne of England from 1485 to 1603. Its founder was Owen Tudor, an obscure Welsh knight, who married Catharine, widow of Henry V., and thus laid the foundation for the future greatness of his house. His son Edmund was made Earl of Richmond by Henry VI., kinsman of Edmund's wife, Margaret. It is through Margaret that the family derived its defective title to the crown. She was the heiress of the Beauforts, children of John of Gaunt by Catharine Swynford, who had been legitimized for every purpose except succession to the throne. Her son, Henry, Earl of Richmond, became head of the Lancastrian house in 1471, and in 1485, at Bosworth Field, defeated Richard III., who fell in the battle. Henry was able to secure the support of the Yorkist faction of the nobility upon promising to marry Elizabeth, the heiress of the York family. Parliament confirmed Henry's claim to reign of his own right, though the lawful heir was either his wife, Elizabeth, or, if females could not inherit the crown, her cousin Edward, the Earl of Warwick. The Tudor monarchs were Henry VII. (1485-1509), Henry VIII. (1509-47), Edward VI. (1547-53), Mary (1553-58), and Elizabeth (1558-1603). The Stuart dynasty, which succeeded to the throne in 1603, derived its title through Margaret, daughter of Henry VII., who married James IV. of Scotland. During the Tudor period the Crown was nearly absolute. The dynasty as a whole was a strong, purposeful one, and while the rights and functions of Parliament were not formally denied, its deliberations were controlled either by royal influence over the elections or by vigorous and tactful management. The local institutions, however, retained their full vigor and the English people thereby retained their training in self-government. When the danger of feudal anarchy and foreign invasion had passed away, and public safety no longer required a strong executive, Tudor absolutism speedily disappeared under the weak and tactless Stuart dynasty. For details and bibliographies, see the names of the separate sovereigns. See also Roses, Wars of the; York, House of.

TUDOR, Mary (1496-1533). Queen of France. She was the daughter of Henry VII. of England. In 1514 she was married to Louis XII. of France and after his death, in 1515, to Charles Brandon, Duke of Suffolk. Her only child, a daughter, Frances, became the wife of Henry Grey, Marquis of Dorset, and was the mother of Lady Jane Grey.

TUDOR, William (1779-1830). An American merchant and author, born in Boston. He was founder (1815) and first editor of the *North American Review*. He graduated at Harvard (1796), engaged in business, visited Europe, and on his return took part in founding the Anthology Club and contributed frequently to its magazine, *The Monthly Anthology* (1803-11). Out of this club grew the Boston Athenæum (1807), of which Tudor was also a founder. He originated the movement for erecting Bunker Hill Monument. In commerce he gained distinction as a pioneer in the ice trade with tropical countries. He was a member of the Massachusetts Legislature for some years, appointed United States consul at Lima, Peru (1823), and chargé d'affaires in Brazil (1827). He published *Letters on the Eastern States* (1820), *Miscellanies* (1821), *Life of James Otis of Massachusetts* (1823), and an anonymous political allegory, *Gebel Teir* (1829), written in Rio de Janeiro, where he died.

TUDOR STYLE. In English architecture, a rather indefinite term applied to the late Perpendicular (q.v.) and the transition from that to Elizabethan (q.v.).

TUFA (It., calcareous rock). A name applied to any crypto-crystalline variety of calcium carbonate which has a cellular structure, especially those varieties deposited from springs or streams. A similar material emanating from volcanoes is known as *volcanic tufa*.

TUFF (Fr. *tuf*, *tuffe*, from It. *tufo*, *tufa*, from Lat. *tophus*, *tofus*, tufa, calcareous rock). Fragmental volcanic material when compacted together to form a rock. The material which by cementation of some kind has formed the tuff may be finely comminuted (volcanic ash or sand), or of larger fragments (lapilli and bombs). A large proportion of tuffs have been laid down under water, or have been carried by water in the form of volcanic mud. In rare cases they are composed largely of crystals. Unconsolidated volcanic fragments are called agglomerate, or agglomerate tuff. If large and angular fragments predominate in a tuff it is often called a volcanic breccia. Such breccias are produced when a stream of lava flows over and picks up an agglomerate, and also when certain viscous lavas flow down a slope. In the latter case the lava stream consolidates in a shell about a central molten mass, the shell constantly fracturing and as quickly healing its fractures by outflow and consolidation of molten material.

TUFTS, Cotton (1734-1815). An American physician, born in Medford, Mass. He graduated at Harvard in 1749, studied medicine, and settled at Weymouth, Mass., and in 1765 wrote the instructions regarding the Stamp Act to the representatives of Weymouth in the Provincial Legislature. He was one of the founders of the Massachusetts Medical Society and of the American Academy of Arts and Sciences, being president of the former in 1787-95, and was a member of the State convention which ratified the Federal Constitution.

TUFTS COLLEGE. A coëducational institution under Universalist control at Medford, Mass., founded in 1852, comprising the College of Letters, the Divinity School (1869), the Medical School (1893), the Dental School (1899), and a Summer School. It confers the degrees of Bachelor of Arts, Philosophy, Science and Divinity, Master of Arts, Doctor of Philosophy, Medicine, and Dental Medicine, and Civil, Electrical, and Mechanical Engineer. The course of study is almost entirely elective, only two subjects, English and mathematics, being required for one year. Provision is made in the Bromfield-Pearson School for students whose preparation for engineering studies is deficient. It has a biological laboratory at South Harpswell, Maine. The attendance in 1903 was 340 in the College of Letters, 18 in the Divinity School, 407 in the School of Medicine, and 197 in the School of Dentistry. The campus of 125 acres and the 20 college buildings were valued at $1,000,000. Among the buildings is the Barnum Museum of Natural History, given by the late P. T. Barnum, with a large zoölogical collection, especially rich in skeletons and mounted skins of mammals. In 1903 the college owned property to the amount of $2,000,000, and had an endowment of $1,700,000 and an income of $200,000. The library contained 50,000 volumes and is a depository for Government publications.

TU FU, tōō fōō (712-70). One of the most noted of the poets of China. He was born in 712 in Siang-yang (q.v.) in the present Province of Hu-peh, according to one authority, or in Tu-ling in Shen-si, according to another. An official career having been closed to him through lack of success in the literary examinations, he became a professional poet, and between the years 742 and 755 he produced three descriptive poems which gained for him the favor of the Emperor then reigning, and a position at Court, where he became very popular. Internal troubles, however, compelled the Emperor to flee, and Tu Fu fell into the hands of the rebels, from whom he managed to escape in 757. He was recalled by the new Emperor, and became a censor. Having in this capacity defended an official who had incurred the displeasure of the Emperor, he fell into disgrace, was banished from the Court, and given the petty position of a sub-prefect in a small town of Shen-si. This he promptly resigned and retired to Sze-chuen. He made the acquaintance in 761 of the military commandant of the province, who brought his case to the notice of the Emperor, and a post was provided for him in connection with the Board of Works. This he held for six years, until the death of his friend the commandant, when he resumed his wandering life. He produced a great many poems. The edition published in 1059 contained 1405 compositions. He is the most quoted poet in China. See specimens in Giles, *Chinese Literature* (New York, 1901).

TUGENDBUND, tōō'gĕnt-bōōnt. An association organized at Königsberg, Prussia, in February, 1808, for the purpose of furthering the physical and moral regeneration of the Prussian people in the period of national degradation following the disasters of the years 1806-07 and the dismemberment of the Prussian kingdom by Napoleon I. at Tilsit. Its secret purpose was the overthrow of the French domination. It was dissolved in December, 1809, after it had accomplished much good in its self-appointed task of bringing to life the spirit of Prussian patriotism.

TUGUEGARAO, tōō-gä'gȧ-rä'ō. The capital of the Province of Cagayán, Luzon, Philippines (Map: Philippine Islands, F 2). Cagayán is the most northern province of Luzon and is exceedingly mountainous. The climate is very severe in the winter, and not healthful in the summer, owing to the excessive humidity. The province is well watered and has a fertile soil; its area is 6587 square miles; the population numbers 112,360. The capital is situated on the river Cagayán, in the southern part of the province. It has a town hall, court-house, and a government building. Population, in 1887, 19,446; now 16,825.

TUILERIES, twēl'rē' (Fr., tile-works). A former royal palace in Paris, situated on the right bank of the Seine, on ground occupied, before the fifteenth century, by a number of tile-works. The site was acquired by Louise of Savoy, mother of Francis I., in 1527, and the erection of the palace was begun about 1565 by Catharine de' Medici. The work was under the direction of Philibert de l'Orme (q.v.), who was succeeded in 1570 by Jean Bullant. The main structure of the original palace comprised a central pavilion, circular in form, and crowned by a cupola. Henry IV. caused the erection of the Pavillon de Flore on the south wing and began the construction of a long gallery connecting it with the Louvre (q.v.). Under Louis XIV. the central pavilion was altered from round to square and the Pavillon de Marsan on the north wing was erected. In spite of its imposing size, the palace possessed little artistic interest, owing to the great and rather unharmonious diversity of architectural form displayed in its long façade. Before the Revolution it was only intermittently a royal residence, though it was frequently the scene of splendid fêtes; in its theatre were given plays of Corneille, Molière, and Voltaire. On October 6, 1789, Louis XVI. and the royal family, brought by the Parisian mob from Versailles, took up their residence in the Tuileries. The palace was invaded by a mob on June 20, 1792, but little harm was done. On August 10th, however, the organized sections of Paris stormed the Tuileries and after a bloody battle cut down the Swiss Guard, who, after defending the great stairway of the palace with devoted courage, were ordered by the King to lay down their arms. The royal family were forced to take refuge in the hall of the Assembly and thence were removed to the Temple. In 1793 the Convention began to hold its sessions in the north wing of the palace, the Pavillon de Marsan being given up to committee-rooms, administrative offices, etc. After the establishment of the Consulate the Tuileries became the residence of Napoleon, and, with successive changes in internal construction, it remained the residence of the rulers of France to the fall of the Second Empire, with the exception of the years 1848-52. During the War of the Commune in 1871 the palace was set on fire (May 24th) at the orders, it is supposed, of the Communist leaders. In the night of May 24th-25th heavy explosions of gunpowder completed the ruin of the main structure. The right wing alone, containing the Pavillon de Flore, escaped destruction. The Pavillon de Marsan was restored in 1875-78. The ruins of the main buildings were removed in 1883. The Garden of the Tuileries, covering about 75 acres, lies between the Place de la Concorde, the site of the palace, the Rue de Rivoli, and the Quai des Tuileries. It was laid out by Le Nôtre in the time of Louis XIV., but has undergone extensive changes, especially under the Second Empire. It contains some notable examples of sculpture, and is a popular resort of the Parisians, being especially a favorite playground with children. See PARIS.

TUKE, DANIEL HACK (1827-95). A celebrated English alienist, born at York. He studied medicine at Saint Bartholomew's Hospital College, of London, and in 1852 became a member of the Royal College of Surgeons, of which he became a fellow in 1857. He was afterwards visiting physician to the York retreat for the insane, and subsequently medical practitioner at Falmouth. He wrote many essays on the treatment of insanity for scientific periodicals, and was coëditor of the *Journal of Mental Sciences*, 1878-92. He wrote a prize essay on the *Progressive Changes which have taken place since the time of Pinel, in the Moral Management of the Insane* (1854); *The Asylums of Holland, Their Past and Present Condition* (1854); *On the Canon of the New Testament* (1860); *Insanity in Ancient and Modern Life* (1878); and a *Dictionary of Psychological Medicine* (1892).

TUKE, HENRY (1755-1814). A Quaker writer, born at York, England. His father was William Tuke (q.v.), one of the founders of the first asylum for humane treatment of the insane. After his education in liberal studies he engaged in business with his father at York, and at the age of twenty-five he became a minister of the Society of Friends. His books were extensively read at home and some of them were translated into French, German, and Danish. The chief of them are: *The Faith of the People Called Quakers* (1801); *The Principles of Religion as Professed by the Society of Christians Usually called Quakers* (1805); and *The Life of George Fox* (1813).—His son, SAMUEL TUKE (1784-1857), studied medicine and became widely known for his strenuous defense of the asylum at York, and for varied philanthropic work. Among his publications are *Descriptions of the Retreat* (1813) and *Practical Hints on the Construction and Economy of Pauper Lunatic Asylums* (1815), which are highly important in the history of the treatment of the insane.

TUKE, WILLIAM (1732-1822). An English philanthropist. He was born in York, was a Quaker in religion, and engaged in mercantile pursuits the greater part of his life, but found time for many works of benevolence. His greatest achievement was the foundation of the York Retreat in 1796, the first institution in England where the insane were treated with kindness and humanity. In this undertaking he had the aid of his son, Henry, Lindley Murray, and other Quakers. Tuke's biography was written by his great-grandson (York, 1856).

TULA, tōō′lȧ. A government of Central Russia. Area, about 11,960 square miles (Map: Russia, E 4). It belongs to the Central Russian plateau and has an undulating surface cut by deep river valleys. It is watered chiefly by the Oka and its tributaries and the Don. Tula belongs to the black soil belt of Russia. In the southwest are deposits of coal, and iron ore is found in all parts. Agriculture is the main occupation, but the household industries are also remarkably developed. The chief manufactured products are small metal articles, 'samovars' (tea-kettles), wagons, musical instruments, arms, etc. The total output was valued at $10,000,000 in 1899. The trade in grain is extensive. Population, in 1897, 1,432,743.

TULA. The capital of the Government of Tula in Russia, situated on the Upa, 121 miles south of Moscow (Map: Russia, E 4). It is an interesting and important town, with an old kremlin rising above the river, an extensive Government arms factory and a museum. Tula has also a number of private arms factories, and extensive metal works, where the 'samovars' (tea-kettles) for which Tula is famous are manufactured. Population, in 1897, 111,048.

TULA. A Mexican town of the State of Hidalgo, 45 miles by rail north of the City of Mexico, on the Tula River (Map: Mexico, J 7). The town, the ancient capital Tollan, is believed to have been founded by the Toltecs and contains the ruins known as 'Montezuma's Palace,' and others of interest attributed to those people. The fortress-like church and cloister of San José date from 1553. There are some cotton manufacturing establishments. Its present municipal population, based on the census of 1895, is about 5000.

TULA. A Mexican town of the State of Tamaulipas, 66 miles southwest of Ciudad Victoria. It is an important commercial centre in a rich agricultural district. The population of the municipality in 1895 was 19,421.

TULALIP, tōō-lä′lĭp (North American Indian, bay, inlet). A tribe of Salishan stock (q.v.) occupying a reservation of 36 square miles on Tulalip Bay, an eastern inlet of Puget Sound, Washington. They are the remnant of the Skokomish and subordinate tribes, who were assigned to the present reservation by the treaty of Medicine Creek in 1854, at which time they numbered 1000, but are now reduced by one-half. Through the efforts of Catholic missionaries they are now entirely civilized, half of them being church members, while the rest adhere to their ancient religion or to the new 'Shaker' Indian ceremonial. They are entirely self-supporting, depending partly upon the abundant natural fish supply and partly upon labor among the whites.

TULANE, tû-lān′, PAUL (1801-87). An American philanthropist, born near Princeton, N. J. He received a common-school education and in early life removed to New Orleans, where he engaged in business and acquired great wealth. He retired in 1867, and returned to Princeton. In 1882 he gave $2,000,000 worth of real estate in New Orleans for the erection and endowment of Tulane University (q.v.).

TULANE UNIVERSITY. An institution at New Orleans, La., organized on its present basis in 1884, when the State placed the existing University of Louisiana, chartered in 1845, under the perpetual care of the Board of Administrators of the Tulane Educational Fund. In 1882 Paul Tulane (q.v.) gave his property in that city for the higher education of the "white young persons in the city of New Orleans." His donations up to the time of his death amounted to $1,050,000. In 1886 Mrs. Josephine Louise Newcomb of New York gave the sum of $100,000 to establish the H. Sophie Newcomb Memorial College for the higher education of white girls and young women. A new and thoroughly equipped building for the medical department was given in 1891 by the widow of Dr. Richardson, a former professor, and in 1900 Mrs. Caroline Tilton gave a library building named in honor of her husband. The university consists of the Graduate Department, the College of Arts and Sciences, the College of Technology, the Newcomb Memorial College, the Law Department, and the Medical Department. It confers the bachelor's degree in arts, science, engineering, and law, the master's degree in arts and pharmacy, the doctor's degree in philosophy and medicine, and the degrees of mechanical, civil, chemical, and sugar engineer. All the departments are situated in the city of New Orleans. The campus contains about 18 acres, with 6 acres devoted to athletics. The total attendance in 1903 was 1364, the faculty numbered 91, and the library contained 45,000 volumes. The value of the grounds and buildings was estimated at $830,000, the total valuation of the university property being $2,186,000. The endowment was $1,230,000 and the gross income $129,000.

TULASNE, tụ'lȧn′, LOUIS RENÉ (1815-85). A French botanist, born at Azay-le-Rideau (Indre-et-Loire). After studying law, he turned his attention to botany and made a specialty of parasite mushrooms, becoming the founder of modern mycology. From 1842 to 1872 he was, at first 'aide naturaliste,' then professor at the Museum of Natural History in Paris, lived afterwards at Cannes, and died at Hyères. His most important publications include: *Histoire et monographie des champignons hypogées* (1851); *Selecta Fungorum Carpologia* (1861-65), with his brother Charles; and many monographs in the *Annales du Muséum*, *Annales des Sciences Naturelles*, *Flora Brasiliensis*, and other periodicals. Among several discoveries he made, that of polymorphism of mushrooms created an epoch in the science.

TULCEA, or **TULTCHA,** to͞ol′chȧ. A district town of the Dobrudja, Rumania, situated on an arm of the Danube, about 45 miles from the Black Sea (Map: Balkan Peninsula, G 2). It has a good harbor, with an extensive trade in fish, grain, and wool. Population, in 1900, 18,800.

TULIP (OF., Fr. *tulipe*, from *tulipan*, tulip, *tulipant*, *tulpant*, *toliban*, *tolopan*, turban, from Turk. *tulband*, *dulband*, from Pers. *dulband*, turban), *Tulipa*. A genus of showy hardy plants of the order Liliaceæ, easily recognized by its fleshy brown-skinned bulbs, broad or linear leaves, and generally erect and usually solitary-flowered scapes. About 45 species are described, mostly natives of the warmer parts of Asia and Southern Europe. For several centuries the tulip has been a popular ornamental plant for spring and early summer flowering and has recently been used by florists for winter flowering. The species from which most of the cultivated varieties have been derived, *Tulipa Gesneriana*, is a native of Asia Minor and was brought from Constantinople to Germany by Conrad Gesner in 1559, since when innumerable varieties have been originated, 1800 varieties being offered by Dutch growers, who are the leading producers of these bulbs. The cultivated varieties of tulips are classified by florists as to their color into 'selfs,' flowers of one solid color; 'bizarres,' flowers with a clear yellow base or centre with orange, red, crimson, and other markings; 'roses,' flowers variegated with shades of rose, deep red, or scarlet; and 'byblœmans,' flowers of dark colors such as lilac, purple, brown, and black. Several other species have given rise to cultivated varieties, but to a much more limited extent. *Tulipa suaveolens*, a native of Southeastern Europe, is the wild species from which the early red and orange Duc van Thol tulips have been obtained. They are inferior to the common garden tulip in beauty, but are prized for their fragrance and earliness. (See Colored Plate of LILIACEÆ.) *Tulipa præcox* is the generally cultivated form of *Tulipa Oculus-solis*, a beautiful species from Southern France, characterized by a large black spot with a yellow border at the

TULIP (*Tulipa Gesneriana*).

base of each petal. *Tulipa Greigi*, a native of Turkestan, is a very fine species from which several cultivated forms have been developed. The natural species are rarely grown. Tulips are cultivated in gardens on all kinds of soils and in all positions, but they prefer a rich, sandy loam. The bulbs or offsets are planted in mid-autumn and the flowers appear in spring. When the plants have blossomed and the leaves have begun to dry the bulbs are taken up, dried in a cool airy place, and stored in a dry place until planting time. For pot culture tulips are treated like hyacinths. Young plants are also obtained by sowing the seed in light sandy soil under a cold frame in late winter. Seedlings seldom flower before they are five years old and are rarely stable; that is, after flowering one or more times they 'break' or develop a new form of color, which remains stable not only with the individual bulb, but with its offsets.

During the first half of the seventeenth century interest in the tulip rose to a speculative basis. Bulbs sold for fabulous prices, even 13,000 florins ($5200) being paid for a single specimen of *Semper Augustus*. Ownership in individual bulbs was divided into shares; bulbs were sold before their existence and by men who possessed none; and of some varieties far more were sold than existed. The craze was short-lived, but it financially ruined many families.

TULIP TREE (*Liriodendron tulipifera*). A beautiful North American tree of the natural order Magnoliaceæ, found from Vermont to Michigan and south to Florida, Mississippi, and Arkansas, having a stem sometimes 100 to 140 feet high, and 5 to 9 feet thick, with a grayish-brown cracked bark, and many gnarled and brittle branches. The solitary terminal flowers resemble tulips. The bark has a bitter, aromatic taste, like other members of the Magnoliaceæ. The tulip tree is one of the most beautiful ornaments of pleasure-grounds. In some parts of the Mississippi Valley it forms considerable forests, seldom or never occurring alone, but in mixed woods. The heart-wood is yellow, the sap-wood white. The timber is easily wrought, takes a good polish, and is much used for house carpentry and other purposes where a light wood is desired. Fossil leaves of ancestors of the tulip tree are found in abundance in the North American and Arctic Cretaceous rocks. These earliest representatives had leaves that were not so distinctly lobed and that resembled, in their entire margins, more nearly those of the very young individuals than those of the full-grown trees of the modern plant.

TULL, Jethro (1674-1741). A noted British agriculturist and writer. He was born at Basildon, Berkshire, and entered Oxford in 1691, but two years later took up the study of law at Gray's Inn. In 1699, shortly after becoming a barrister, he settled upon a farm at Howberry, where, having trouble in making his laborers carry out his advanced ideas, he endeavored to make implements which would do the work "more faithfully than such hands would do." The results of his experiments are set forth in his *Horse-Hoeing Husbandry, or an Essay on the Principles of Tilling and Vegetation* (1733; 2d ed., with addenda, 1743; 3d ed. 1751). French translations appeared in 1753 and 1757, and a new and somewhat altered edition was put forth by William Cobbett in 1822. This work, which is the first of its kind, exercised a profound influence on methods of soil management, and upon it Tull's fame chiefly rests. See Tillage.

TULLA, tul′lȧ, Johann Gottfried (1770-1828). A German engineer. He was educated in Heidelberg and Freiburg, and after filling various engineering appointments became chief engineer of the construction of water and road ways for the Grand Duchy of Baden in 1813. He founded the Engineer School of Baden, and subsequent to 1818 had much to do with the preparation of the plans for the deepening of the River Rhine. He wrote *Ueber die zweckmässigste Behandlung des Rheins* (1822), *Ueber die Rektifikation des Rheins* (1825).

TULLE, tul. The capital of the Department of Corrèze, France, 106 miles by rail southwest of Clermont-Ferrand (Map: France, H 6). It is a picturesque town with quaint houses. The cathedral (fifteenth century), with a fine bell tower, and the abbot's house (fifteenth century), are noteworthy. A large Government firearms factory is in the suburb of Souilhac. From Tulle first came the famous lace of that name. Population, in 1891, 15,384; in 1901, 17,412.

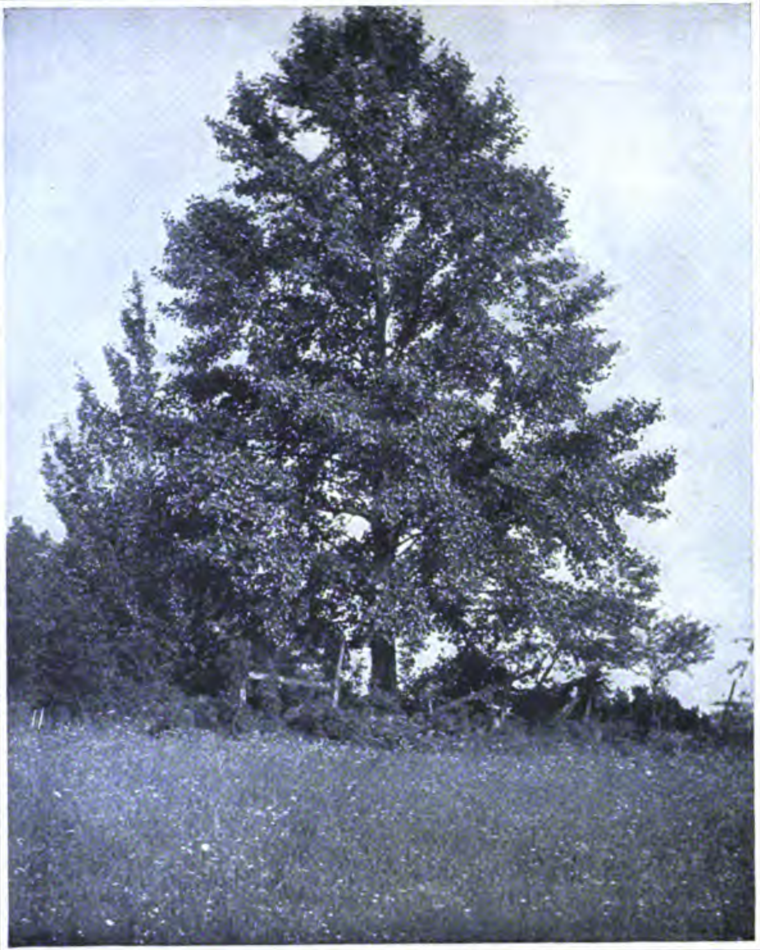
TULLIBEE (North American Indian name). A well-marked and valuable whitefish (*Argyrosomus tullibee*) of the Great Lakes, Lake of the Woods, and northward. It is bluish with white sides showing silvery stripes.

TULLIUS, Servius. The sixth legendary king of Rome. He is said originally to have been a slave of Tanaquil, the wife of Tarquinius Priscus. The latter befriended him, and Tullius, after marrying the daughter of Tarquinius, practically became the ruling power in the State. This aroused the ire of the sons of Ancus Marcius, who were in line of succession, and they caused Tarquinius to be assassinated. Tanaquil, however, frustrated their plans by concealing the fact of her husband's death until Tullius had obtained a firm hold in the government. According to tradition the reign of Tullius was marked by important reforms, notably the promulgation of a new constitution and the formation of an alliance with the Latins. The new constitution, which aimed to give the plebeians political independence and to make property rather than birth the basis of political influence, was offensive to the patricians, who, under the leadership of Lucius, a son of Tarquinius Priscus, formed a conspiracy, which resulted in the assassination of Tullius. Tradition also adds that Tullia, the daughter of Tullius and wife of Lucius, as she was returning from the Senate, which, countenancing the atrocious murder of Tullius, had recognized the claims of Lucius to the throne, drove her chariot over her father's dead body, which still lay in the street, where he had been struck down by the assassins.

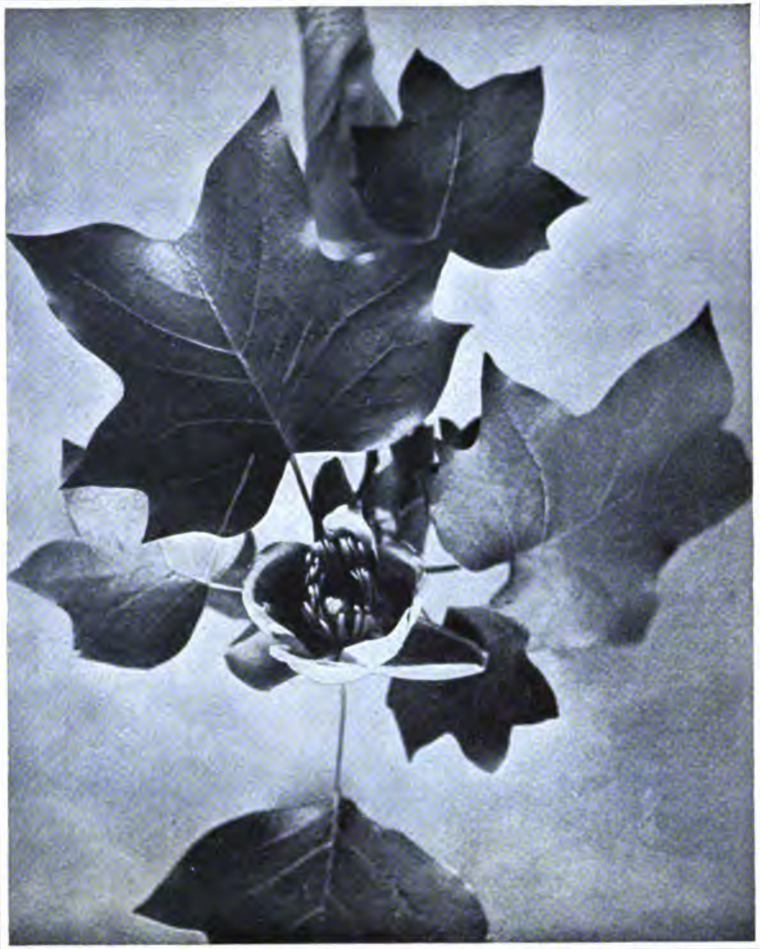
TUL′LIVER, Maggie. The heroine of George Eliot's *Mill on the Floss*. She is the daughter of the miller, and with her brother is drowned by a tidal wave.

TUL′LOCH, John (1823-86). A Scottish scholar and educator. He was born at Dron, Perthshire, was educated at Saint Andrews, and ordained at Dundee, in 1845, as a minister in the Church of Scotland, and became principal of

TULIP TREE



TULIP TREE (Liriodendron tulipifera).



FLOWERING BRANCH.

Saint Mary's College, in the University of Saint Andrews. In 1859 he was appointed one of her Majesty's chaplains for Scotland. He was highly appreciated as a broad-minded, progressive theologian, was moderator of the General Assembly in 1878, was appointed dean of the chapel royal and dean of the Thistle in 1882, and died at Torquay. Among his works are: *Theism* (1855); *Leaders of the Reformation* (1859; 3d ed. 1883); *English Puritanism and Its Leaders* (1861); *Beginning Life* (1862); *Rational Theology and Christian Philosophy in England in the Seventeenth Century* (1872; 2d ed. 1874); *The Christian Doctrine of Sin* (1876); *Modern Theories in Philosophy and Religion* (1884); *Movements of Religious Thought in Britain During the Nineteenth Century* (1885). Consult his *Life* by Mrs. Oliphant (London, 1888; 3d ed. 1889).

TULTCHIN, tōōl′chĕn. A town in the Government of Podolia, Russia, 100 miles east of Kamenetz-Podolsk. Population, in 1897, 19,202.

TULUS, tōō′lōōz. One of the civilized, or half-civilized, Dravidian peoples of Hindustan. They inhabit the coast region about Mangalore, and number some 350,000. Their language is closely related to ancient Kanarese. Consult: Brigel, *Grammar of the Tulu Language* (Mangalore, 1872).

TUMACO, tōō-mä′kō. A seaport of the Department of Cauca, Colombia, 150 miles southwest of Popayán (Map: Colombia, B 3). It has an extensive local steamer trade with Guayaquil and Panama. Population, about 6000.

TUMBLE-BUG. See DUNG-BEETLE.

TUMBLEWEEDS. Plants, chiefly annuals, especially abundant in prairie regions. They scatter their seeds as they are rolled or tumbled from place to place by the wind. See SEED.

TUMOR (Lat., swelling, state of being swollen). In medicine, an abnormal increase in size of an area of tissue or of an organ; a swelling, excluding swellings occurring in the course of simple inflammation. In pathology, a tumor is an overgrowth or hypertrophy, deviating in size and shape from the normal, with an inherent power and method of growth, this growth being independent of the rest of the body. Pathologists include under the term tumor ulcerations and their boundaries, when such boundaries are composed in part, at least, of new tissue. Pathologically, then, a tumor is a growth of new tissue in the body which causes local increase in the size of the part or organ in which it occurs. Tumors are distinctly pathological, subserving no useful physiological purposes; in fact, usually growing at the expense of useful tissues and organs.

The tissues of which tumors are composed conform to the same general types as are normally found in the body, with the exception that in the case of some tumors there is a tendency toward the reversion of the tissues to embryonic forms. Tumors usually originate in tissues which are of like structure with that of the tumor itself. Thus connective-tissue tumors usually take their origin in connective tissue, epithelial tumors in epithelium, etc. When such tumors remain confined to the tissues in which they originate they are known as homologous tumors. When, however, they spread to surrounding tissues of a different type, or when, as occurs in the case of malignant tumors, new tumors are started in distant tissues and organs by means of the dissemination of bits of tissue from the primary growth through the blood and lymph, they are known as heterologous tumors.

Some tumors are congenital, notably the nævi or vascular tumors. In some cases there appears to be a distinct hereditary tendency to tumor formation; yet ideas as to the heredity of cancer are grossly exaggerated in the minds of the laity, for, while the occurrence of cancer in several generations has been observed, the absence of cancer in the children and grandchildren of persons who have been afflicted with the most malignant forms has been equally noted. Inflammation resulting from injury, especially from long-continued slight irritation, seems to be a frequent cause of tumor formation, injuries to bone being quite frequently followed by the development of osteo-sarcoma. Also injury, as for example from a blow or from a fall, not infrequently precedes the development of cancer of that organ. Cancer of the tongue or lip is often apparently traceable to the constant irritation of a broken clay pipe or of a rough tooth. In general it would seem that tumors of the connective-tissue type (sarcoma) most frequently follow a single injury, as for example from a blow, while tumors of the epithelial type (epithelioma, carcinoma) are more apt to occur as the result of frequently repeated slight irritations. Chronic inflammation seems to bear some causative relation to tumor formation. This is evident in the frequent association of carcinoma of the liver with cirrhosis of that organ. Again, malignant tumors or cancer not infrequently find their starting point in such local malformations as skin nævi. Age and sex also play important rôles among the predisposing causes of tumors. Thus epithelial cancer or carcinoma is rare in persons under thirty years of age. Cancer of the breast is far more common in the female, this being undoubtedly due to the greater functional activity of that organ in the female. Cancer of the tongue and lip is, on the other hand, much more common in the male. This is probably due to the fact that frequent irritation from smoking is much more common in that sex.

As to the primary causative factor in the production of tumors we have as yet very imperfect knowledge. Of the many theories which have been advanced in explanation of tumor growth, probably the most ingenious and the one to which at present greatest credence is given is one advanced by Cohnheim. According to his theory, during embryonal development some cells stop developing. These cells may either remain in among tissues of their own kind or may become displaced in the course of further development of the surrounding tissues and so come to lie among other tissues. Such cells lie dormant for long periods until something in their environment calls them into activity, when they proceed to develop with all the potential growth of young embryonal cells. Furthermore, being unlimited by the wear and tear of physiological function, as is the case with normal tissues and organs, they are free to devote their entire energies to growth. For these two reasons, the high potentiality for growth of embryonal tissue and the lack of any control of the growth by the requirements of function, tumor tissue, especially of the embryonal type, is apt to be characterized by a sort of irregular, wild cell-growth quite different from the orderly arrangement of cells in normal tissues. While Cohnheim's hypothesis offers a very satisfactory explanation of most of the phenomena connected with the growth of tumors, it must be remembered that it is as yet purely a theory, with absolutely no basis in known facts; that no one has ever been able to demonstrate any of these little islands of embryonal tissue lying dormant and waiting to be excited into tumor formation. Bacteria as the excitants of tumor formation have been exploited by some investigators. While some at present believe that the true cause of cancer will ultimately be found to be bacterial in nature, the majority tend to the opinion that the presence of bacteria in tumors is an external accidental occurrence rather than an internal causative factor.

Tumors grow (1) by direct extension from the periphery, and (2) by a growth of the tumor at its centre and a consequent pushing outward of its peripheral parts, or 'central growth.' (3) Tumors also extend by what is known as metastasis. This with the formation of what are known as metastatic tumors occurs by the dissemination of cancer cells by means of the blood and lymph. In this way bits of cancer tissue are carried to remote parts of the body. This metastasis from a single primary focus may occur in any tissue or organ, and quite commonly occurs in many tissues and organs either in succession or at approximately the same time. It is one of the surest evidences of the malignancy of the original tumor. These cancer cells lodging in the tissues set up new centres of growth, of the same nature as the mother growth. As the process of growth goes on in tumors so also does the process of degeneration. Tumors may ulcerate or become gangrenous, abscesses may form in them, and they may undergo fatty or calcareous degeneration. Degenerative changes are more frequent in the softer more rapidly growing forms.

Various classifications of tumors have been suggested, all of which are more or less unsatisfactory. Clinically, tumors are frequently simply divided into two classes: (1) benign tumors, or tumors which are in themselves harmless, and (2) malignant tumors, as cancer and sarcoma. The most common and as yet most satisfactory classification of tumors is morphological, based upon their structure relative to the normal body tissues. The following is the classification given in Delafield and Prudden's *Handbook of Pathological Anatomy and Histology* (1902):

CONNECTIVE-TISSUE TYPE.	
Normal Tissue.	*Form of Tumor.*
Fibrillar connective tissue:	Fibroma.
Mucous tissue:	Myxoma.
Embryonal connective tissue:	Sarcoma.
Endothelial cells:	Endothelioma.
Fat-tissue:	Lipoma.
Cartilage:	Chondroma.
Bone:	Osteoma.
Neuroglia:	Glioma.
MUSCLE-TISSUE TYPE.	
Smooth-muscle tissue:	Leiomyoma.
Striated-muscle tissue:	Rhabdomyoma.
NERVE-TISSUE TYPE.	
Neuroglia.	
VASCULAR-TISSUE TYPE.	
Blood vessels:	Angioma.
Lymph vessels:	Lymphangioma.
EPITHELIAL-TISSUE TYPE.	
Glands:	Adenoma.
Various forms of epithelial cells and associated tissues:	Carcinoma.

Classification according to histogenesis (developmental history of the tissues) has been attempted; and while there are reasons for believing that embryology may ultimately furnish the proper basis for tumor classification, that which it has thus far furnished is less satisfactory from a practical standpoint than the morphological classification. When, as is not infrequently the case, more than one kind of tissue is present in a tumor, a combination of terms is used to designate its nature. Thus a combination of a tumor composed of embryonal connective tissue with a bony tumor is known as an osteo-sarcoma; a muscle-tissue tumor in which much more than the usual amount of connective tissue is present, as a fibro-myoma, etc. In addition to the new growths included in the classification given there are other forms of tumors or of structures sometimes called tumors which do not fall within any of the subdivisions of the classification. Among these may be mentioned cysts of various kinds, including the so-called 'dermoid cyst' and teratoma; such congenital tumors as moles, nævi, and angiomata, etc. The peculiar placental tissue tumor known as deciduoma may also be mentioned.

NON-MALIGNANT TUMORS. These are composed of tissues of the types found in the adult and are in themselves not dangerous to life, although sometimes serious from pressure upon or involvement of important organs. They do not as a rule grow as rapidly as do malignant tumors; they do not tend to recur when completely removed, do not form metastases, do not involve neighboring lymph glands, and do not as a rule interfere with the general health of the patient.

Fibroma.—This tumor is composed of fibrillar connective tissue of the type found in the adult. Fibromata vary even more greatly in consistency than does ordinary fibrous tissue, those containing many fibres and few cells being hard and firm, *fibroma durum;* those containing proportionately many cells being soft, *fibroma molle.* They are commonly inclosed in a definite fibrous capsule. The softer fibromata are frequently very vascular, while the harder forms usually contain few vessels. They are found in the skin and subcutaneous connective tissue, in the connective tissue framework of the various organs, in the mucous membranes, in the intermuscular septa, in nerve sheaths, etc. Mucous polypi of the nose are examples of this kind of tumor.

Myxoma.—Myxomata are tumors composed of tissue which resembles a type of tissue found only in extremely small amount in the adult and known as mucous tissue. Mucous tissue is therefore essentially embryonic. These tumors resemble the fibromata in structure, being made up of connective-tissue cells with a fibrillar intercellular substance. The softer tumors are known as *myxoma gelatinosum*, or *myxoma molle,* while those of greater consistency are known as *myxoma medullare.* Myxoma is of comparatively rare occurrence in pure form. More commonly myxomata are combined with tumor tissue of other types to form complex tumors of which the most common are lipo-myxoma and fibro-myxoma. They most frequently develop in fat.

Lipoma.—Lipomata are fatty tumors. They may be quite firm from the presence of fibrous tissue, *fibro-lipoma*, or soft, *lipoma molle.* Lipoma is a very common form of tumor, being often superficial, developing in the subcutaneous fat. Lipomata may, however, develop anywhere where fat is found and consequently have a wide distribution. They are generally inclosed in firm fibrous capsules and occur usually on the shoulders, back, or forearms.

Chondroma.—These are tumors in which the new-formed tissue resembles cartilage of either the hyalin or fibrous variety.

Osteoma.—Osteomata or bony tumors are rather rare as pure tumors. Associated with other forms of tumor tissue (as osteo-sarcoma, osteo-fibroma, etc.), they are more common. Osteomata as a rule develop in bone. Less commonly they originate in other tissues.

Glioma.—Gliomata are connective-tissue tumors which follow the structure of the nervous system connective tissue, or neuroglia. Gliomata are soft and usually vascular, thus predisposing to hemorrhage. They are also extremely liable to fatty degeneration. As a pure type they are rare. Associated with other forms of connective-tissue new growths, the glyo-sarcoma, glyo-myxoma, etc., they are more common. They occur chiefly in those parts of the nervous system where neuroglia is found, e.g. in the brain and cord, the ganglia, and in the optic and olfactory nerves.

Myoma.—Myomata are tumors whose tissue elements are analogous to those found in muscle tissue. Like normal muscle, they may be divided into two forms, one in which the tissue elements are smooth, or involuntary muscle, the other in which the tissue elements are striated, or voluntary muscle. To the former the name 'leiomyoma' or 'myoma levicellulare' has been given, to the latter the name of 'rhabdomyoma' or 'myoma striocellulare.' Myoma is rare.

Neuroma.—Neuromata are divided into true neuromata and the so-called false neuromata. True neuromata are extremely rare. They consist of nerve tissue and may be of the ganglionic type in which new nerve cells develop, or of the fibrillar type which consist of new-formed nerve fibres. Neuromata may be single or multiple, the latter frequently occurring along the branches of distribution of a single peripheral nerve. They occur in stumps after amputation of a limb and are often extremely painful. The 'false neuromata' are not neuromata at all, but fibromata, sarcomata, myxomata, etc., of the connective tissue of the nerve trunks.

Angioma.—These tumors consist of newly formed blood or lymph vessels and are of two kinds, hæmangioma and lymphangioma. The former are subdivided into simple angioma or *angioma telangiectoides* and *angioma cavernosum.* The simple angiomata are composed of masses of blood vessels, mainly capillaries, held together by connective tissue. The so-called 'strawberry' marks or vascular nævi, usually of the face, are congenital tumors of this variety.

TUMORS SOMETIMES BENIGN, SOMETIMES MALIGNANT. *Endothelioma.*—These tumors originate from that type of connective tissue known as endothelium which forms the linings of blood vessels, lymphatics, etc. On account of their extremely cellular character and on account of the reduction of their intercellular basement substance to a minimum, these tumors bear a close morphological resemblance to the carcinomata, among which they are often classed. Endotheliomata are most common in the pleura, peritoneum, dura mater, and pia mater. Less frequently they occur in brain, liver, ovaries, testicle, lymph nodes, salivary glands, bone, and skin. They may be large or small, single or multiple, and may form metastases.

Adenoma.—Adenomata are epithelial tumors in which the epithelium is glandular in type and is arranged in more or less distinct alveoli. They thus correspond in structure to a gland. The alveoli are supported as tumors in the irregularity of the arrangement of their component elements. Blocking up of the ducts of the glandular tissue sometimes leads to an accumulation of secretion within the alveoli and the formation of cysts. When this cyst formation is a prominent feature of the growth the term cyst-adenoma is used to designate the tumor. Of these the most important is the multilocular cyst-adenoma of the ovary. Most adenomata are non-malignant, rather slow growing tumors. The most common sites are the ovary, mammary gland, kidney, liver, submaxillary, sublingual, parotid, thyroid, and lachrymal. They also occur in those mucous membranes which are supplied with glands, as for example the mucous membranes of the stomach, intestines, nose, pharynx, etc. The most common sites of malignant adenomata are the stomach, intestines, mammary gland thyroid, and uterus.

MALIGNANT TUMORS. *Sarcoma.*—Sarcomata are tumors of the connective-tissue group. They differ from connective-tissue tumors in that the connective tissue of which the sarcomata are composed is of the embryonal form. This has a very distinct bearing upon their malignancy, for, as has been already mentioned, embryonal tissues possess much greater powers of growth than do adult tissues. Sarcomata are usually classified according to the character and arrangement of their cellular elements. Thus we have small round-celled, large round-celled, small spindle-celled, large spindle-celled, giant-celled or myeloid, stellate-celled sarcoma, etc. The ends of long bones like the tibia and humerus are frequently affected. The mammary glands are sometimes the sites of sarcoma, as also the sheaths of peripheral nerves. Sarcoma is as a rule an affection of early life. From ten to forty it is most common, and uncommon after the latter age. The two sexes are about equally susceptible.

Carcinoma.—Carcinomata are malignant tumors of epithelial tissue. The epithelium is as varied in character as is normal epithelium. The epithelial elements are supported by a more or less abundant connective-tissue framework, or stroma, which forms bundles of fibres irregular in arrangement, and in the meshes of which are cavities or alveoli in which the epithelial cells lie loosely without any definite arrangement. In general the epithelial cells conform to the different normal types; but we find, as is the case with all cancerous growths, an irregularity as to shape, size, and arrangement which is much more marked than in normal epithelium. And even in a carcinoma where a particular type of cell predominates, other forms of cell are frequently intermingled with the predominating form.

Carcinoma occurs as a primary tumor in tissues of epiblastic origin. It originates in any of the various forms of epithelium. It is not believed to occur as a primary tumor in such tissues as bone, muscle, etc., which originate in other embryonic layers. Carcinoma may, however, involve any of the body tissues. When it involves tissues other than epithelial, it is probable that the growth is secondary, the primary tumor in epithelium being so small as to have passed unrecognized.

The very hard and firm form of carcinoma so common in the female breast is known as 'scirrhous cancer' or fibro-carcinoma. Its hardness is due to the large amount of dense fibrous tissue, the cellular elements being comparatively few. Very soft carcinomata, made up almost entirely of cells with a minimum amount of connective tissue, are called 'medullary cancer' or *carcinoma molle*. Melano-carcinomata are tumors in which more or less brown or black pigment is deposited in the cells or in the connective-tissue stroma. Carcinomata whose cells have undergone mucoid degeneration or whose stroma is of the type found in mucous connective tissue are known as 'carcinoma myxomatodes.' Gelatinous carcinoma is a form of carcinoma in which the cells become filled with a translucent gelatinous material. In some tumors these droplets of gelatinous substance, which have taken the place of the epithelial cells, coalesce to form considerable areas of gelatinous material. These areas frequently give an alveolar appearance, for which reason this form of carcinoma is frequently referred to as 'alveolar carcinoma.'

Epithelioma is a form of carcinoma which originates in squamous epithelium. The structure of the tumor tissue corresponds roughly to that of squamous epithelium as seen in the skin and mucous membranes. Thus there are flattened squamous surface cells, irregular cells such as are found in the deeper layers of the skin, 'prickle' cells, cuboidal cells, etc. Not infrequently squamous cells are packed in together in crescentic forms known as epithelial 'pearls.' Epithelioma or 'epithelial cancer' is most common around the orifices of the body where skin and mucous membranes unite, as for example around the openings of the mouth, nose, eyes, vagina, etc. The malignancy of an epithelioma depends much upon the growth powers of its cells and the extent to which these cells tend to infiltrate surrounding tissues. In general it may be said that epitheliomata are the most slow growing and least malignant of all forms of cancer. They may, however, recur unless completely removed and may form metastases.

MALIGNANCY OF TUMORS. Many tumors which are in themselves benign in character may be dangerous to life from their position and consequent interference with the functions of important organs. Such tumors, although sometimes causing death, are not classed as malignant tumors. Malignant tumors proper present certain well-defined characteristics of their malignancy. Among these may be mentioned, first, their tendency to local recurrence after removal. This has led to the rule of the surgeon when operating on cancer to cut wide of the growth, even though the tumor may seem small and insignificant, in the hope of removing all trace of cancerous tissue even at the sacrifice of some healthy tissue. This local recurrence after apparently complete removal is undoubtedly due to the fact that cancer cells have extended out beyond the limits of the visible tumor. It is customary in some cases to have immediate microscopical examination made of the periphery of the mass removed, to determine the presence or absence of cancer cells at the outer limits of the operation. Secondly may be mentioned the tendency of a malignant tumor to extend by direct continuity of growth to surrounding tissues. In 'discontinuous peripheral growth' there are at first microscopic extensions outward of cancer cells from the periphery of the tumor. These grow and form nodules near, though at first separated from, the main tumor mass, but which afterwards spread and usually join the original tumor. A third and very characteristic mark of malignancy in a tumor is the formation of what are known as metastatic tumors. These are secondary tumors of the same general nature as the parent growth. They may occur in any tissue or organ, no matter how distant, and are the result of cancer cells disseminated through the blood and lymph. These cells, lodging, form the starting points of new or secondary or metastatic growths. These secondary growths may also act as new centres of infection from which other metastatic tumors may arise. A fourth evidence of malignancy is the effect of the presence of the cancer upon the general health of the patient. General impairment of the patient's health is due to many factors, such as the drain upon the whole system of a rapid new growth, the absorption of injurious matter from the tumor itself, the effect of suppuration or necrosis, etc., and is known as 'cancerous cachexia.'

DEVELOPMENT AND TREATMENT OF CERTAIN TUMORS. Carcinoma, or scirrhous cancer, is the form most frequently seen in the breast, where it is invariably primary. It follows a blow or other injury, in many cases; often no cause can be assigned. It most commonly commences as a small, circumscribed tumor, round, hard, slowly growing, and with little or no pain. As it increases in size it becomes irregular, granular, and adherent to the adjacent parts. Infiltration of the surrounding structures follows, the pectoral muscles may become involved, and the skin may become attached. The skin also becomes stretched and shining, stiff and brawny. Œdema of the arm follows, with enlargement of the axillary glands. The pain now becomes intense and fairly constant, extending not only to the shoulder, but down the arm to the hand. The nipple, as in some non-malignant tumors, becomes retracted and deeply attached. As the process goes on the cellular tissue, intercostal muscles, and ribs may become attacked, the pleura may be invaded, and hydrothorax as well as visceral deposits may follow.

The duration of life after the occurrence of scirrhus of the breast is about three years. In old people the progress is slow, and in a few recorded cases life was prolonged for ten years. Most cases occur between the ages of thirty and forty-five years. The treatment consists of removal of the growth as early as found. In most cases the whole breast should be removed, and the axilla be laid open, that all enlarged lymphatic glands may be excised. Caustics are rarely successful. Quacks are prone to diagnose simple fibromata as cancers, and then cure them with caustics. The use of light has proved of increasing efficacy in the removal of malignant growths, and it is confidently expected that Finsen's light or the X-ray will become a substitute for the knife. See PHOTOTHERAPY; X-RAY.

Epithelioma, or 'epithelial cancer,' is often diagnosed from other tumors with much difficulty. The following points are of assistance: (1) It occurs almost invariably on muco-cutaneous surfaces. (2) It ulcerates very early. (3) Ulceration follows upon the new growth so rapidly that it seems to spread by ulceration. (4) It arises after local irritation. (5) There is no metastasis to internal organs in the vast majority of cases of epithelioma. It is common in middle-aged or elderly people. Epithelioma of the lip, an ordinary form, follows smoking (and hence is called 'smokers' cancer'), or irritation from a broken tooth, intermittent pressure of some article held in the mouth, as a painter's dust-brush, etc. It commences generally as a small wart or flat tubercle with hard edges and a suppurating surface. Ulceration spreads, the edges of the ulcer being hard and thickened. It scabs over and the scab scales off again. Glands in the neck become enlarged, and the muscles of the face become involved. Early excision of a liberal V-shaped section of the lip, the larger part being removed from the vermilion border, and the cut edges being stitched together afterward, is the proper treatment. Frequently from three to seven years pass before recurrence in the scar follows, or recurrence may never take place. In some instances the ligature, or the écraseur, or caustic is preferable. The X-ray or Finsen's light may also succeed.

Consult: Delafield and Prudden, *Handbook of Pathological Anatomy and Histology* (New York, 1901); Virchow, *Die krankhaften Geschwülste* (Berlin, 1900); Park, *Surgery by American Authors* (Philadelphia, 1901).

TUNA. See PRICKLY PEAR.

TUN′BRIDGE. A market town in Kent, England, on the Medway, 27 miles southeast of London (Map: England, G 5). The manufacture of toys, boxes, and articles of wood in Tunbridge ware, a mosaic veneer of beech, holly, etc., is a specialty. A notable feature is the remains of a mediæval castle, which stands on the Medway, near the entrance of the town. It has a noble gate tower of great size, richly ornamented. Among other structures are the parish church, a large restored building, and the grammar school, founded in 1553, with an endowment of £5500 a year. Population, in 1901, 12,736.

TUNBRIDGE WELLS. An English inland watering-place, on the border of Kent and Sussex, five miles south of Tunbridge (Map: England, G 5). Its picturesque surroundings, healthful climate, and chalybeate springs have rendered it a fashionable resort since the seventeenth century. It has a large trade in the various articles made of Tunbridge ware. The wells, discovered in 1606, are situated at the head of a promenade called the Pantiles. The principal buildings are the corn exchange, town hall, public hall, sanatorium, and mechanics' institute. The town was incorporated in 1889; it owns an excellent water supply, sewage farms, electric lighting works, and a cemetery. Population, in 1891, 29,254; in 1901, 33,388. Consult Ward, *Surrey and Sussex* (London, 1897).

TUNDRA (Russ., from Finnish *tuntur*, marshy plain). The name given to regions in Arctic America, Asia, and Europe, characterized as swamps of bog moss on which the snow-white reindeer moss and various kinds of lichens flourish. A luxuriant growth of flowering plants is also a characteristic of some of the tundras. The tundras are visited by wild birds in the summer, at which time they are inaccessible morasses, but in the winter they may be readily crossed. The soil at a depth of one or two feet below the surface remains frozen throughout the year, and the thickness of the vegetable growth increases annually, so that the surface of the tundra slowly rises. The rivers that flow through the tundras expose a great depth of layers of ice and frozen soil, in which the bones of the mammoth, the rhinoceros, and other extinct animals are sometimes found. See ALASKA; SIBERIA.

TUNGSTEN (Swed. *tungsten*, from *tung*, heavy + *sten*, stone), or WOLFRAM. A metallic element discovered by d'Elhujar in 1781. It is not found native, but occurs as the tungstate of iron and manganese in the mineral *wolframite*, as the calcium tungstate or *scheelite*, as the trioxide or *wolfram ochre*, and in small quantities in other rare minerals. The metal itself may be prepared by heating the trioxide with carbon or in a current of hydrogen, or by heating the chloride in vapor of sodium.

Tungsten (symbol, W (wolfram); atomic weight, 184.83) is a bright, steel-gray, hard, brittle, crystalline substance, with a specific gravity of 19.12. It melts only at the strongest white heat. It is chiefly used to increase the hardness and tenacity of steel and thus improve it as a material for hard tools. Tungsten combines with oxygen to form a dioxide and a trioxide, the latter of which unites with water to form tungstic acid, which in turn combines with bases to form a series of salts called *tungstates*. Of these the sodium tungstate is sometimes used to replace sodium stannate as a mordant in dyeing and printing. Fibres dipped in a solution of this salt are rendered fireproof.

TUNGSTITE. A mineral tungsten trioxide crystallized in the orthorhombic system. It is of a bright-yellow or green color. It is found with other tungsten minerals in Cornwall and Cumberland, England, and as a coating or in cavities in Monroe, Conn., and Cabarrus County, N. C. The preparation of artificial crystals of this mineral has been reported.

TUNGUS, tụn′gụz. A group of peoples of the Ural-Altaic or Sibiric stock embracing the tribes of the Tungus proper, whose territory extends from the Yenisei to the Pacific and from the Arctic Ocean as far south as latitude 40°, and the Manchus. The Tungus proper consist of the northern Tungus, comprising the Olchas or Mangun, at the mouth of the Amur, the Oroks in the northern part of the island of Saghalien, the Orochons, on both banks of the Amur, the Manegers, on the left bank of the Amur east of the Orochons, and the Olennyiĕ or Reindeer Tungus; the southern Tungus, including the Golds of the lower Amur and the Ussuri, the Oroches on the coast, and the Daurians, or Solon-Daurs, mixed with Mongols in Kulja; and the maritime Tungus or Lamuts of the shores of the Sea of Okhotsk. Among some of the Tungus Shamanism of a primitive sort prevails. The influence of the Russians, which began in the middle of the seventeenth century, is felt chiefly in the social life of the people. The Golds of the Amur, who have long been under the influence of China, have developed an exceedingly interesting ornamental art. They show considerable capacity for civilization. The Manchus are being more and more absorbed by the Chinese, whom their ancestors once conquered. The Tungus generally are of medium height, but the Manchus are often very tall. The skull-form tends to be mesocephalic. Consult: Hiekisch, *Die Tungusen* (Saint Petersburg, 1879); Schrenck, *Reisen und Forschungen im Amurlande* (ib., 1881-91); Castrén, *Grundzüge einer tungusischen Sprachlehre* (ib., 1856).

TUNGUSKA, tụn-gōō′skȧ. A name given to each of the three large eastern tributaries of the Yenisei River in Siberia. They are distinguished as the Upper, Middle, and Lower Tunguska. The first is more commonly known as the Angara (q.v.), the second as the Stony Tunguska, and the third as the Lower Tunguska.

TUNGUSKA, LOWER. The northernmost of the three chief tributaries of the Yenisei River in Siberia (Map: Asia, K 2). It rises on the Vitim Plateau in the Government of Irkutsk, about 200 miles northwest of Lake Baikal, and flows first north, then northwest, joining the Yenisei near Turukhansk, not far from the Arctic Circle, after a course of 1600 miles. Its upper course flows between low banks covered with pine forests, but lower down the banks become higher and rocky, and the river penetrates a range of mountains in a series of rapids. The river is navigable about 450 miles, but it is frozen in its lower course for seven months in the year. The ice here blocks the upper waters in the spring, causing extensive inundations. The Lower Tunguska comes within 14 miles of the Lena River.

TUNĪCA, tōō-nē′kȧ. A North American Indian linguistic stock. See TONĪCA.

TUNICATA (Lat. nom. pl. of *tunicatus*, p. p. of *tunicare*, to clothe with a tunic, from *tunica*, tunic). The single class of the Urochorda containing small marine animals inclosed in a soft elastic tunic, which opens by two apertures (oral and anal), and contains tunicin, a substance resembling cellulose. The tunic is usually thick, tough, and leathery, but may be very thin and delicate, especially in some of the smaller forms. The mouth, supplied with tactile organs, opens into a capacious pharynx, which contracts abruptly into a narrow œsophagus, then expands into a stomach, followed by a more or less coiled intestine that terminates close to the atrial pore or orifice (the other opening in the tunic). The walls of the pharynx are perforated by numerous slits, through which the water entering at the mouth passes out into the cavity of the tunic and thence escapes through the atrial pore, carrying with it the waste matter, reproductive products, etc. The pharynx is thus an important respiratory organ and is correspondingly richly supplied with blood vessels. The heart is peculiar, in that it reverses its beating, pumping the blood in one direction for a time, then pausing and presently pumping the blood in the other direction for an equal length of time. The nervous system is greatly reduced, and sense organs, except those of touch, are generally wanting. The muscular system is well developed in some forms, especially in the tunic, but in others it is reduced and serves chiefly for closing the oral and atrial pores. Reproduction is not only by eggs, but takes place in many forms also by budding. In size and color the tunicates offer the greatest possible diversity. The smallest forms are, as individuals, only a few millimeters long, though the colonies which they compose are often many inches in diameter. The largest individuals are six or eight inches high, though some forms are on stalks of much greater length. In color we find some species jet black and some pure white, and others fire red, but dull shades of greenish, grayish, or brownish are more common. Many of the free-swimming forms are almost transparent and nearly colorless.

The number of species of tunicates is large and the classification has varied greatly with different writers. They are a comparatively well defined group and are now considered as a considerably degenerated offshoot of the branch from which the Chordata have arisen. (See ASCIDIAN.) The tunicates may be conveniently divided into three orders, the Larvalia, the Thaliacea, and the Ascidiacea. The Larvalia are a very small group, containing only one family and few species, remarkable for their small size and free-swimming habits, and the retention throughout life of certain characters which in the other orders occur only temporarily during their development. These larval characters are especially the tadpole form with a tail, the nerve cord, and the persistent notochord or urochord. The Thaliacea are also free-swimming, but are much larger and more degenerate or specialized forms. There are three families, one of which contains the beautiful salpas (q.v.). The order Ascidiacea contains three suborders and a dozen or more families. One suborder is free-swimming like the salpas, and so is called the Salpiformes; the second, called Compositæ, contains fixed forms which multiply extensively by budding and thus form compound organisms, the individuals of which are usually very small; the third suborder, the Simplices, are almost always fixed individuals (see ASCIDIAN); but in many cases large numbers of individuals are united by a common stolon from which they have arisen by budding, and these forms are sometimes known as social ascidians. The Simplices are better known, popularly, than the other suborders, and many of them have popular names, as sea-pork, sea-peach, sea-potato, and sea-squirt.

Consult Herdman, "Report on the Tunicata," in *Challenger Reports*, vol. vi. (London, 1888).

TUNING. The process of bringing into perfect musical accord the strings, pipes or membranes which constitute tone-producing elements of the various musical instruments. As a rule the wind instruments do not require special tuning, for their pitch is constant. Keyed instruments (the piano and organ) require only occasional regulation of their strings and pipes; but the stringed instruments need to be tuned constantly. See MUSICAL INSTRUMENTS; PITCH; TEMPERAMENT.

TUNING-FORK. A contrivance for regulating the pitch of the voice or of a musical instrument. It consists of two prongs of steel springing from a handle, and so adjusted as to produce a fixed note when struck. It is tuned in a^1, which has 435 double or 870 single vibrations per second. The *tuning-cone* is a hollow, metal cone used in tuning the metal flue-pipes of an organ. To lower the pitch of a pipe, the inverted cone is pushed down over its top; to raise the pitch, the point of the cone is inserted in the pipe.

TU'NIS (Fr. *Tunisie*). A French protectorate in North Africa. It is the most northern of African countries, and is bounded on the north and east by the Mediterranean Sea, on the south by Tripoli and the Sahara, and on the west by Algeria (Map: Africa, E 1). Its boundaries are still indefinite, but the area is estimated at 51,000 square miles. Tunis is physically continuous with the rest of Northwestern Africa. The northern part is a mountainous plateau constituting the eastern extension of the Algerian coast range and the main range of the Atlas Mountains. Its elevation is on an average about 1500-2000 feet, rising in the peak of Sidi Ali, and in other summits to heights of 5700-6500 feet. This plateau region is fairly well watered by numerous small streams, many of which are perennial, the vegetation in the northern mountains being abundant, with dense forests. The chief stream is the Mejerda, the ancient Bagradas. The southern half of the plateau, generally treeless, is covered with esparto grass. On the north coast the plateau falls abruptly in steep cliffs toward the sea; on the east coast, however, there is a low region about 60 miles wide, fertile in the north, but becoming arid in the south. The southern half of Tunis belongs to the Sahara region, and, with the exception of a group of mountains in the southeast, is generally low, in some places even below sea level. In its northern part is the great salt marsh of the Jerid, surrounded by numerous hot springs, which are used for irrigation. The date palm is here indigenous, and grows in large numbers, but the rest of the Sahara region is arid. The climate of Tunis is healthful, with a temperature ranging from 50° to 96°. The rainfall averages 22 inches in the north, and is there fairly regular. In the south years may pass without any regular rains, though occasionally there are heavy showers which raise the average to nearly ten inches. The flora and fauna are almost identical with those of Algeria (q.v.). Geologically Tunis is of comparatively recent formation, the mountains being mostly Tertiary, the coast region Quaternary, and parts of the plateau Cretaceous.

The chief mineral products are zinc, lead, iron, salt, gypsum, phosphates, and marble. Agriculture, the main industry, shows signs of progress. Cereals and the vine are mainly cultivated in the northern part, where the holdings are small. Farther south the holdings are large and devoted to stock-breeding and the cultivation of olives (about 500,000 acres) and date palms. The chief products are olives and olive oil, grain, fruits, and cork. The leading acreages in 1900 were 1,075,000 each for wheat and for barley. Large numbers of sheep, goats, cattle, camels, asses, and mules are reared. Tunis has practically no industries except the native or household. Carpets, saddles, and other leather articles and woolen goods are produced. The fisheries, controlled by the Italians, are active and yield principally allaches, sardines, and sponges. There are sixteen ports, three of them excellent. In 1901 they registered an entering tonnage of 2,724,092—about one-half French. The trade is increasing, but chiefly in imports, the exports in 1901 having been only about 60 per cent. of the imports. The total commerce in 1895 amounted to about $16,400,000; in 1901, to $20,760,000. Olives and olive oil, cereals, animals and animal products represent the leading items of the exports; cereals and textiles (notably cottons) those of the imports. Nearly one-half the total trade is with France. There are 576 miles of railway—all controlled by the French.

The French protectorate dates from 1881. At the nominal head of the Government is the native Bey, assisted by nine ministers—seven French and two native—who administer nine departments. There is also the Minister of Foreign Affairs, who is the French Resident-General. He is virtually the Viceroy. All foreigners are governed directly by the French. Tunis has thirteen civil and two military districts and a military post—all in charge of French representatives. French tribunals of justice deal with cases involving foreigners, and native courts with those of the Tunisians. The French army stationed here numbers about 20,000 men. The capital is Tunis. The budget for 1901 balanced at $8,000,000; for 1902, at $10,800,000—including the large items connected with the State railways (nearly 50 per cent.). The other prominent items are expenditures in connection with the debt. The debt was consolidated in 1884, and amounted to $27,768,740. In 1888 it was put in the form of a 3½ per cent. loan guaranteed by France. The coinage, weights, and measures are for the most part French.

The population is estimated at about 1,900,000 and consists chiefly of Berbers and Arabs. They profess Mohammedanism. The foreign population in 1901 was composed mainly of 67,420 Italians and 38,889 French. There are numerous French as well as Mohammedan schools, a Mohammedan university in Tunis, and a college. Tunis is as rich in antiquities as almost any part of Italy. Punic, Roman, and Byzantine ruins abound, the two former classes representing magnificent epochs. The site of Carthage is still marked by the remains of substructures. A fine museum of relics has been established here. The Bardo collection near the capital is valuable.

The early history of Tunis is connected with that of Carthage (q.v.). After the fall of Carthage the region became the Roman province of Africa (Africa in the narrower sense), subdivided into the northern district of Zeugitana and the southern district of Byzacium (Provincia Byzacena). Carthage was rebuilt, and in the second and third centuries of the Christian Era was one of the most important cities of the Roman Empire. The Romans were vanquished by the Vandals under Genseric in 429. The Vandals held the country until their King, Gelimer, was conquered and taken prisoner in 534 by Belisarius (q.v.), the general of the Byzantine Emperor Justinian. Tunis then remained under Byzantine rule until the conquest by the Arabs in the seventh century. Under Mohammedan rule the city of Kairwan rose to great splendor. After having formed for more than a century a part of the dominions of the caliphs, the country was ruled successively by the dynasties of the Aglabites, Fatimites, Almohades, and Merinides. In the middle of the twelfth century it was for a short time under the rule of Roger II. of Sicily. In 1270 Louis IX. of France, having undertaken a crusade, died during his invasion of Tunis, and in 1390 the French under the Duke of Bourbon were again unsuccessful, being repulsed at Mahdiya. In the fourteenth century Tunis became independent under the Hafsite rulers and had an era of comparative prosperity. In 1535 Charles V. undertook an expedition against the famous corsair Khair-ed-Din (Barbarossa), who had established himself at Tunis, captured the city, and liberated over 20,000 Christian slaves. In 1575 Sinan Pasha conquered the country and incorporated it with the Ottoman Empire. The government was placed in the hands of a Turkish pasha, a divan or council, composed of the officers of the Turkish garrison, and the commander of the janizaries.

After a few years, however, an insurrection of the soldiery broke out, and a new government was established, the head of which was a 'dey' possessing limited authority, the chief power being at first exercised by the military divan. But gradually an officer, with the title of 'bey,' whose original functions were confined to the collection of tribute and taxes, acquired a supremacy over the other authorities, and finally obtained a kind of hereditary sovereignty. The beys of Tunis made conquests on the mainland and piratical enterprises against Christian powers at sea. During the eighteenth century Tunis became tributary to Algeria. About the beginning of the nineteenth century Hamuda Pasha put an end to this dependence, subdued the Turkish militia, and created a native Tunisian army, in consequence of which Tunis virtually attained independence. The subsequent rulers, Achmet Bey (1837-55), Mohammed Bey (1855-59), and Mohammed Sadyk Bey (1859-82), were liberal, enlightened sovereigns. In 1871 the Sultan renounced the tribute formerly exacted, and fixed the future relations of the Sublime Porte to Tunis. The Bey was to receive his investiture from Constantinople; without the Sultan's authority he could neither declare war, conclude peace, nor cede territory; the Sultan's name was to appear on all the coinage; the army was to be at the disposal of the Porte. In internal matters, however, the power of the Bey was to be absolute. In 1881 France, with the ostensible purpose of chastising the Khrumirs, who had made raids into Algerian territory, sent an expedition into Tunis. At the same time a French squadron appeared before the capital and the Bey was forced to enter into an engagement establishing a French protectorate over the country. Thereupon an insurrection broke out, and it was only after much bloodshed that the French were able to compel submission. In July, 1881, they took Sfax, and in October they occupied Kairwan. By the close of the year the country was subdued. The French protectorate has contributed to the material progress and prosperity of Tunis.

BIBLIOGRAPHY. Desgodins de Souhesmes, *Tunis: histoire, mœurs, gouvernement* (Paris, 1880); Reid, *The Land of the Bey* (London, 1882); Hesse-Wartegg, *Tunis, Land und Leute* (Vienna, 1882; Eng. trans., London, 1899); Graham and Ashbee, *Travels in Tunisia* (London, 1887), which has a bibliography; Olivier, *La Tunisie* (Paris, 1898); Desfossés, *La question tunisienne et l'Afrique septentrionale* (ib., 1881); Rivière, *La Tunisie; géographie, événements de 1881, organisation, politique et administration* (ib., 1886); Lallemand, *La Tunisie, pays de protectorat français* (ib., 1891); Faucon, *La Tunisie avant et depuis l'occupation française* (ib., 1893); *La Tunisie française* (ib., 1896), published by the Government; Bertholon, *Les populations et les races en Tunisie* (ib., 1896); Leroy-Beaulieu, *L'Algérie et la Tunisie* (2d ed., ib., 1897); Tissot, *Exploration scientifique de la Tunisie* (ib., 1884-88); Carton, *Découvertes épigraphiques et archéologiques, faites en Tunisie* (Lille, 1895); Clarin de la Rive, *Histoire générale de la Tunisie* (Paris, 1895).

TUNIS. The capital of Tunis. It is situated near the southwestern extremity of the Lake of Tunis, about three miles from the ruins of ancient Carthage (Map: Africa, F 1). The lagoon or Lake of Tunis is shallow, and communicates with the Gulf of Tunis, an inlet of the Mediterranean, by a narrow strait known as the channel of Goletta. The gulf itself is 45 miles broad at the entrance. The town occupies rising ground, and both the city proper and the suburbs are surrounded by walls. The streets of the inner town are narrow, unpaved, and dirty, but the bazaars are well furnished, and many of the mosques are splendid, particularly the Mosque of Yussuf. The palace of the bey is probably the finest building in Tunis. The citadel, begun by Charles V. and finished by Don John of Austria, is interesting from its collection of old arms. The newer French or foreign quarter, established since 1893, has a European aspect. The city contains a Mohammedan university and a national museum of arts and antiquities. Water is supplied by means of a restored ancient aqueduct from Jebel Zaghwan. Tunis is the commercial centre of the State, and carries on an important trade with Europe and Central Africa. Ocean-going vessels reach the town directly by means of a canal opened in 1893. Tunis has silk and woolen manufactures of shawls, tapestries, mantles, burnooses, caps, turbans, colored cloths; also leather, soap, wax, and olive oil, all of which it exports, together with grain, fruits, cattle, fish, ivory, gold dust, coral, etc. The climate is unhealthful.

Tunis (ancient *Tunes*) was a Carthaginian city, frequently mentioned in connection with the Punic wars. It became important under the Arabs. (See TUNIS, Protectorate.) The population is estimated at about 170,000, of which 50,000 are Europeans and 40,000 Jews.

TUNKERS. See GERMAN BAPTIST BRETHREN.

TUNNEL (OF. *tonnel*, tunnel, tun, pipe, *tonnelle*, arbor, arched vault, tunnel, diminutive of *tonne*, pipe, tun, ML. *tunna*, OHG. *tunna*, Ger. *Tonne*, AS. *tunne*, Eng. *tun*, both the Romance and Germanic words apparently borrowed from Ir., Gael. *tunna*, tun). An artificial gallery, passage, or roadway beneath the ground, under the bed of a stream, or through a hill or mountain. The art of tunneling has been known to man since very early times. A king of Egypt upon ascending the throne began at once to drive the long narrow passage or tunnel leading to the inner chamber of the rock-cut tomb at Thebes which was to form his final resting place. Similar rock-cut tunneling work was performed by the Nubians and Indians in building their temples, by the Aztecs in America, and, in fact, by most of the ancient civilized peoples. The first built up tunnels of which there are any existing records were those constructed by the Assyrians. The vaulted drain or passage under the southeast palace of Nimrud, built by Shalmaneser II. (B.C. 860-824), is in all essentials a true soft-ground tunnel. A much better example is the tunnel under the Euphrates River, which may quite accurately be claimed to be the first subaqueous tunnel of which there exists any record. It was, however, built under the dry bed of the river, the waters of which were temporarily diverted and then turned back into their normal channel after the tunnel work was completed, thus making it a true subfluvial tunnel only when finished. The Euphrates River tunnel was built through soft ground, and was lined with brick masonry, having interior dimensions of 12 feet in width and 15 feet in height. Only hand work was employed by these ancient peoples in their tunnel construction. In soft ground the tools used were the pick and shovels or scoops. For rock work they possessed a greater range of appliances.

Research has shown that among the Egyptians, by whom the art of quarrying was highly developed, use was made of tube drills and saws provided with cutting edges of corundum or other hard, gritty material. The usual tools for rock work were, however, the hammer, the chisel, and wedges; and the excellence and magnitude of the works accomplished with these limited appliances attest the unlimited time and labor which must have been available for their accomplishment.

The Romans should doubtless rank as the greatest tunnel-builders of antiquity in the number, magnitude, and useful character of their works and in the improvements which they devised in the methods of tunnel-building. They introduced fire as an agent for hastening the breaking down of the rock, and also developed the familiar principle of prosecuting the work at several points at once by means of shafts. Their method of operation was simply to build large fires in front of the rock to be broken down, and when it had reached a high temperature to cool it suddenly by throwing water upon the hot surface, thus producing cracks and fissures.

The Roman tunnels were designed for public utility, especially for aqueducts and roads. One of the most notable of the tunnels of larger section is that which gives the road between Naples and Pozzuoli passage through the Posilipo hills. It is excavated through volcanic tufa, and is about 3000 feet long and 25 feet wide, with a section of the form of a pointed arch. In order to facilitate the illumination of this tunnel, its floor and roof were made gradually converging from the ends toward the middle; at the entrances the section was 75 feet high. This double funnel-like construction caused the rays of light to concentrate as they approach the centre, and thus to improve the natural illumination. This tunnel was probably excavated during the time of Augustus, although some authorities place its construction at an earlier date.

During the Middle Ages the art of tunnel-building was practiced for military purposes, but seldom for the public need and comfort. Every great castle had its private underground passage from the central tower or keep to some distant concealed place to permit the escape of the family and its retainers in case of victory by the enemy, and during the defense to allow of sorties and the entrance of supplies. The tunnel-builders of the Middle Ages added little to the knowledge of the art. Indeed, until the seventeenth century and the introduction of gunpowder no particular improvement was made in the tunneling methods of the Romans. Although gunpowder had been previously employed in mining, the first important use of it in tunnel work was at Malpas, France, in 1679-81, in the tunnel for the Languedoc Canal. This tunnel was 510 feet long, 22 feet wide, and 29 feet high, and was excavated through tufa.

With the advent of gunpowder and canal construction the first strong impetus was given to tunnel-building in its modern sense as a commercial and public utilitarian construction. Canal tunnels of notable size were excavated in France and England during the last half of the seventeenth century. These were all rock or hard-ground tunnels. Indeed, previous to 1800 the soft-ground tunnel was beyond the courage of the engineer except in sections of such small size as hardly to deserve the name of tunnels. In 1803, however, a tunnel of 24 feet wide was excavated through soft soil for the Saint-Augustine Canal in France. Timbering was employed to support the walls and roof as fast as the earth was removed and the masonry lining was built closely following it. From the experience gained in this tunnel were developed the various systems of soft-ground subterranean tunneling since employed. It was through the development of the steam railway, however, that the art of tunneling was to be brought into its present prominence. In 1820-26 two tunnels were built on the Liverpool and Manchester Railway in England. This was the beginning of the rapid development which has made the tunnel one of the most familiar of engineering structures. The first railway tunnel in the United States was built on the Allegheny Portage Railroad in Pennsylvania, in 1831-33; and the first canal tunnel had been completed thirteen years previously (1818-21) by the Schuylkill Navigation Company, near Altoona, Pa.

The art of tunneling entered its last and greatest phase with the construction of the Mont Cenis Tunnel in Europe and the Hoosac Tunnel in America. The Mont Cenis Tunnel was undertaken to facilitate railway communication between Italy and France, or, more properly, between Piedmont and Savoy, the two parts of the kingdom of Victor Emmanuel II. separated by the Alps. It is 7.6 miles long and passes under the Col de Fréjus near Mont Cenis. Work was begun in 1857 and finished in 1870. It was from the close study of some of the difficulties, the great length of the tunnel, and the desire of the engineers to finish it quickly, that all the different improvements were developed which marked this work as a notable step in the advance of the art of tunneling. Thus the first power drill ever used in tunnel work was devised by Sommeiller, one of the engineers. In addition compressed air as a motive power for drills, aspirators to suck the foul air from the excavation, air compressors, turbines, etc., found at Mont Cenis their first application to tunnel construction. This important rôle played by the Mont Cenis Tunnel in Europe in introducing modern methods had its counterpart in America in the Hoosac Tunnel, completed in 1875. In this work there were used for the first time in America power rock-drills, air compressors, nitroglycerin, electricity for firing blasts, etc. There remains now to be noted only the final development in the art of soft-ground submarine tunneling, namely, the use of shield and metal lining. The shield was invented and first used by Sir Marc Isambard Brunel in excavating the first tunnel under the River Thames at London, which was begun in 1825 and opened in 1843. In 1869 Peter William Barlow used an iron lining in connection with a shield in driving the second tunnel under the Thames at London. From these inventions has grown up one of the most notable systems in tunneling now practiced, known as the shield system.

Construction. Tunnels may be classified according to the general nature of the materials penetrated, into hard-rock tunnels and soft-ground tunnels. Whatever the material penetrated, the general methods of construction are the same, but a variety of differences in detail exist. In certain kinds of tunnels, such as subaqueous tunnels and tunnels under city streets, other conditions than the hardness of the material penetrated exercise a controlling influence. For the purpose of description, therefore, it is common to classify tunnels into hard-rock tunnels, soft-ground tunnels, open-cut tunnels, and submarine tunnels. In open-cut tunnels and submarine tunnels the material penetrated may be either rock or earth. When it has been decided to construct a tunnel the first task is to construct a geological map which will show as accurately as may be determined the character and inclination of the earth's strata to be penetrated, the probability of water being encountered, etc., all of which exercise an important influence upon the difficulties and cost of the work. The next step is to establish exactly the centre line of the tunnel; this is done on the surface of the ground and its purpose is to find the exact length of the tunnel and to furnish a reference line by which the excavation is directed. The determination of the centre line is a simple problem in surveying, requiring only skill and exactness for its successful solution; the longer the tunnel, and the higher and more inaccessible the mountain is above it, the more difficult is the work. So perfect, however, has the skill of the surveyor become that it is a common thing to work within a small fraction of a foot in alignment in driving a long mountain tunnel.

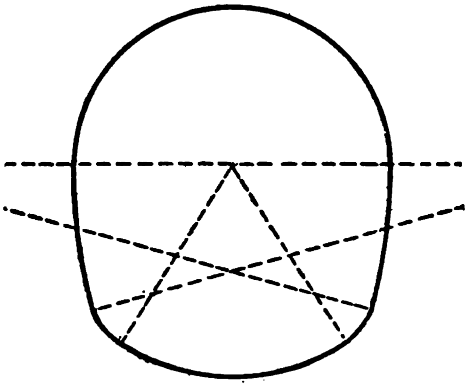


Fig. 1. Diagram showing cross-section of polycentric figure.

The centre line being established, the next task is to establish the form and dimensions of the cross-section of the hole or passageway which it is proposed to excavate. The form and dimensions of cross-section adopted are determined by the purpose to which the tunnel is to be put and by the character of the material penetrated. The best one for the majority of conditions, and the one most commonly employed, is the polycentric figure (Fig. 1), in which the number of centres and length of the radii are fixed by the engineer to meet the particular conditions which exist. The dimensions to be given to the cross-section of a tunnel depend upon the purpose for which it is to be used, as will be observed in the succeeding descriptions of prominent tunnels. In all cases the form and the dimensions are those of the inside of the completed tunnel, which is of course the inside of the lining in all cases except those of unlined hard-rock tunnels, where it is the inside of the original excavation.

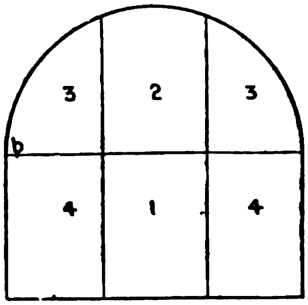


Fig. 2. Diagram showing sequence of galleries in drift method of hard-rock tunneling.

Excavation. The work so far described is of the nature of engineering investigation and design. The actual construction of work consists in excavating in the earth or rock a passageway which follows the established centre line and conforms in dimensions and shape to the established cross-section. In performing this work of excavation the whole area of the cross-section is seldom removed at once, but it is subdivided into two or more galleries, which are excavated in a measure independently of each other and which together form the full cross-section. The objects of thus subdividing the work are several in number, the more important being as follows: By driving a number of galleries each somewhat in advance of the succeeding one, several gangs of men can be worked without interfering with each other; the first gallery, being driven far ahead, serves to drain the earth and to disclose in advance the nature of the material that will be encountered; in soft material several small galleries can be driven and timbered with much less danger of caving than can one large gallery. The number and arrangement of the galleries vary with the materials penetrated and with the system of tunneling adopted. The first gallery excavated is called a heading when it is situated at the top of the cross-section, and a drift when it is situated at the bottom of the cross-section. The excavation of the main sections is termed enlarging the profile.

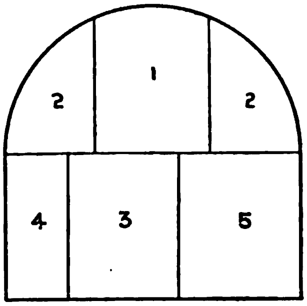


Fig. 3. Diagram showing sequence of galleries in European hard-rock tunnel.

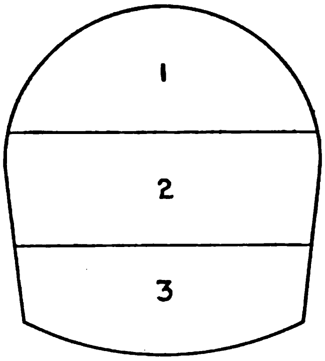


Fig. 4. Diagram showing sequence of galleries in American heading method of hard rock tunneling.

Two general methods of excavating rock tunnels are considered practical by engineers; in one the profile is enlarged from a drift and in the other it is enlarged from a heading. The sketch Fig. 2 shows the usual sequence of galleries by which the full cross-section is enlarged from a drift. This method of excavation is quite commonly practiced in Europe, but is seldom employed in America. Among the most notable tunnels built by enlarging a drift are the Mont Cenis and the Simplon, both of which are more fully described farther on in this article. The more common method of tunneling through hard rock is to begin the work by a heading instead of by a drift. This heading may be of small dimensions and the remainder of the section may be removed in successive small parts, or it may be the full width of the section and the enlargement completed in one other cut. When the tunnel is excavated by means of several cuts, which is the method usually employed in Europe, the sequence of galleries is indicated by Fig. 3. When the excavation is made by a single wide heading and a single other cut for removing the bench, which is the method preferred by American engineers, the sequence of galleries is the simple one indicated by Fig. 4. The Saint Gotthard Tunnel, described farther on, is one of the most notable tunnels excavated by enlarging a heading by means of several cuts; the Cascade Tunnel in Montana is a notable example of the wide heading and single-bench method.

In all rock tunnel work the various galleries are excavated by drilling and blasting the rock. The most difficult gallery to excavate is the first heading or drift, as the case may be. Based on the mode of blasting employed, there are two methods of driving the advance gallery, known as the circular and the centre-cut methods. In the first method a set of holes are first drilled near the centre of the front in such a manner that they inclose a cone of rock; the holes, starting at the perimeter of the base of the cone, converge toward a junction at its apex. Seldom more than four to six holes are comprised in the first set. Around these first holes are driven a ring of holes which inclose a cylinder of rock, and if necessary succeeding rings of holes are driven outside the first ring. These holes are blasted in the order in which they are driven, the first set taking out a cone of rock, the second set enlarging this cone to a cylinder, and the other sets enlarging this cylinder. These holes are seldom driven deeper than four or five feet. In the centre-cut method, which is the one commonly employed in America, the holes are arranged in vertical rows and are driven from 15 feet to 20 feet deep. The two centre rows of holes converge toward each other so as to take out a wedge of rock, but the others are bored 'straight' or parallel with the vertical plane of the tunnel. In conclusion it may be stated that the present high development of labor-saving machinery for excavating rock makes this material one of the safest and easiest to tunnel, with which the engineer ordinarily has to deal. A necessary equipment for tunneling through rock requires a steam or a water-power plant for pumping air or water under pressure, and in large tunnels these power plants are often of considerable size. See **Drill**; **Blasting**.

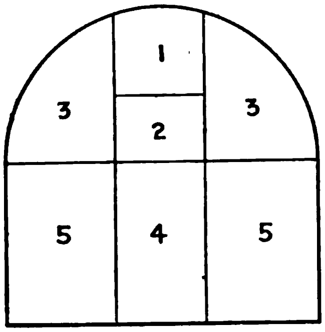


Fig. 5. Diagram showing sequence of galleries in Belgian method of soft ground tunneling.

There are a variety of methods of tunneling through soft ground. Some of these, like the open-cut method and the shield method, differ entirely, while in others, like the Belgian, German, English, Austrian, and Italian methods, the difference consists simply in the different order in which the drifts and headings are driven, in the difference in the number and size of these advance galleries, and in the different forms of strutting framework employed. The shield system is considered separately under the succeeding heading of *Submarine Tunnels.* The other methods may be described briefly as follows: The Belgian method of tunneling is the one most commonly employed in soft soils. It consists in excavating the upper part of the section first; then building the masonry arch which is supported upon the unexcavated ground; and finally in excavating the lower portion of the section and building the side walls and floor or invert. The sequence of galleries is shown by Fig. 5. In the German method two drifts are first opened at each side of the tunnel near the bottom. Other galleries are excavated one above the other on each side to extend or heighten the first two until all the perimeter is open except across the bottom. The masonry lining is then built from the bottom upward on each side of the crown of the arch, and then the centre core is removed and the invert is built. The sequence of galleries is shown by Fig. 6. In the English and Austrian methods short lengths of the whole sectional profile are excavated before beginning the masonry. In the English method the lengths of section excavated vary from 10 to 25 feet. The masonry invert is built first, then the side walls, and finally the roof arch. The excavators and masons work alternately, the excavation being stopped while the masonry is being built and vice versa. The Austrian method differs in two particulars from the English; the length of section opened is made great enough to allow the excavators to continue work ahead of the masons, and the side walls and roof are built before the invert. The Italian method is very seldom employed because of its cost, but it can often be used successfully in very soft ground when other methods fail. It consists in excavating the lower half of the section and building the invert and side walls and then filling the space between the walls in again except for a narrow passageway for the cars for handling structural material and removing the waste; next the upper half of the section is excavated, as in the Belgian method, and the arch is built; and finally the filling in the lower part is permanently removed. Tunnels through quicksand are driven by one of the previously described soft-ground methods after draining away the water, or else as submarine tunnels.

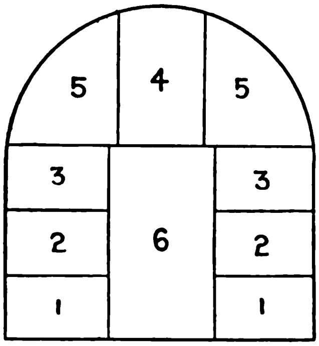


FIG. 6. DIAGRAM SHOWING SEQUENCE OF GALLERIES IN GERMAN METHOD OF SOFT-GROUND TUNNELING.

In short tunnels or tunnels of great depth beneath the surface the excavation is carried on from the two ends only, but in long tunnels when the depth is not too great shafts are sunk at intervals along the tunnel line, and excavation is carried forward in both directions from the foot of each shaft as well as from the two ends. Tunnel shafts are merely vertical walls, and they may be either temporary or permanent. Temporary shafts are usually made rectangular in section and are filled in after the tunnel is completed; permanent shafts are usually made circular, lined with brickwork, and left open to supply ventilation. When shafts are used, elevators operated by hoisting engines have to be employed to hoist out the cars loaded with excavated material.

TIMBERING AND LINING. The purpose of timbering or strutting in tunnel work is to prevent the caving in of the roof and side walls of the excavation previous to the construction of the

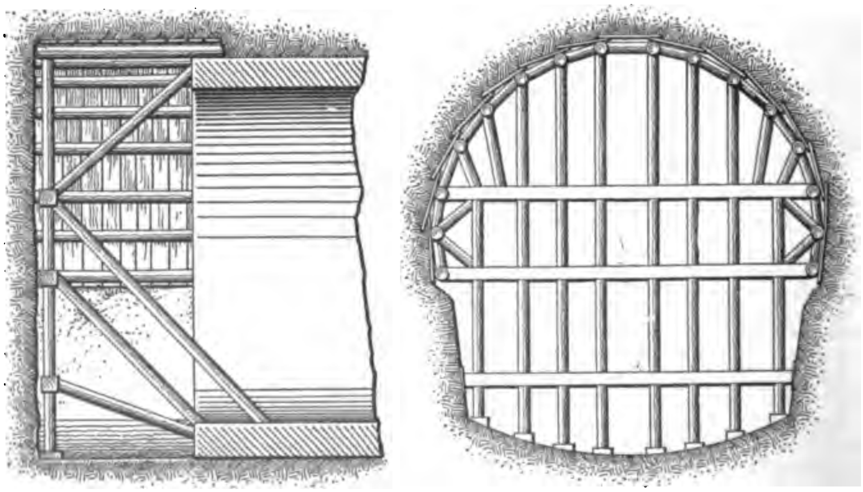


FIG. 7. SYSTEM OF STRUTTING PRACTICED IN ENGLISH METHOD OF SOFT-GROUND TUNNELING.

lining. Timber is nearly always employed for strutting in tunnel work, but iron strutting of special form is sometimes employed. The method of strutting employed depends upon the nature of the material penetrated. (Fig. 7.) In the hard, firm rock no strutting is employed; when the rock is cracked or shelly in spots only, an occasional prop and beam is all that is necessary; in soft and broken rock and in soft ground the framing is continuous, and in very soft material often forms practically a water-tight lining. Tunnels are lined with timber (Fig. 8), with masonry (Figs. 9 and 10), and with cast-iron cylinders. Timber lining is used only in America and is intended to be replaced by masonry at some future date. The most common form of masonry lining is brickwork or a brickwork roof arch with stone masonry side walls. In recent years monolithic linings of concrete have been considerably used.

Iron lining is practically limited to submarine tunnels driven by the shield system. In masonry-lined tunnels niches (Fig. 11) are built into the side walls at intervals to serve as places of refuge and in some cases for the storage of tools and supplies. The ends of the tunnel lining nearly always terminate in a portal designed and constructed with some pretensions to architectural beauty.

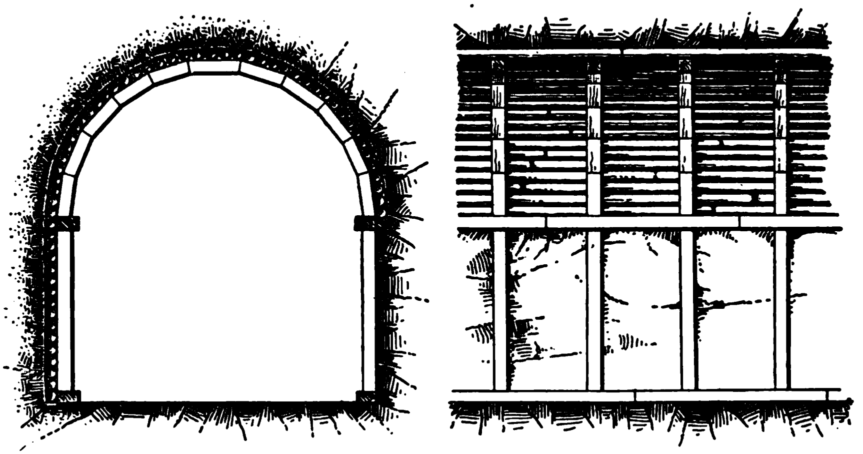

Cross Section. Longitudinal Section,

FIG. 8. A TYPICAL FORM OF TIMBER LINING FOR TUNNELS.

OPEN-CUT TUNNELING. When a tunnel or rapid transit subway has to be constructed at a small depth below the surface, the excavation is generally performed more economically by making an open cut, building the lining inside it, and filling in the space outside the lining, than it is by subterranean tunneling proper. The necessary condition of small depth which makes open-cut tunneling desirable is most generally found in constructing rapid transit tunnels under city streets. This fact introduces the chief difficulties encountered in such work, since the surface traffic makes it necessary to obstruct the streets as little as possible. The two methods of open-cut tunneling commonly practiced may be classed as the longitudinal-trench method and the transverse-trench method. The simplest manner by which to construct open-cut tunnels is to open a single cut or trench the full width of the tunnel masonry. This trench is strutted by means of side struttings of vertical planks held in place by transverse beams extending across the trench and abutting against longitudinal timbers laid against the strutting planks. The lining is built in this trench and then filled around and above with well-rammed earth, after which the surface

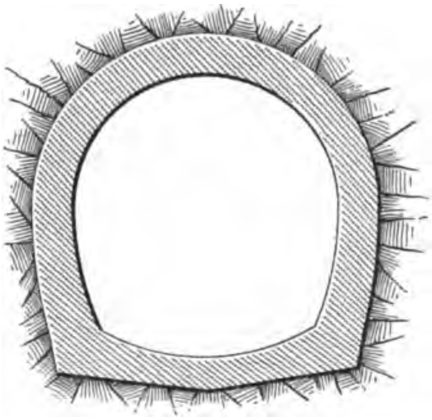


FIG. 9. CONCRETE LINING FOR TUNNELS.

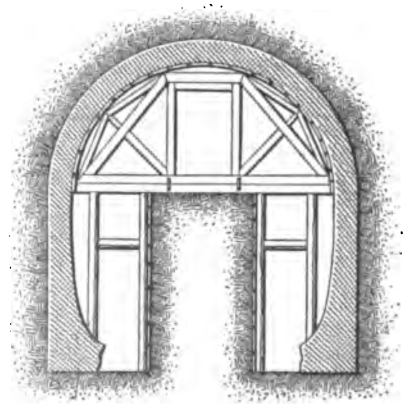


FIG. 10. TYPICAL MASONRY LINING FOR TUNNELS.

of the ground is restored. Generally the trench is opened in short lengths and each length is completed ready for surface traffic before the adjacent length is opened. Another form of longitudinal trench method is to open two narrow parallel trenches in which are built the side walls. The soil between these walls is then removed to a sufficient depth to permit the roof to be built and covered over, and the final process is to take out the core of earth inclosed by the side walls and roof. Generally one side wall and one-half of the roof arch are completed and covered over before the other side wall and half arch are begun. By this arrangement of the work one-half of the street is always unobstructed.

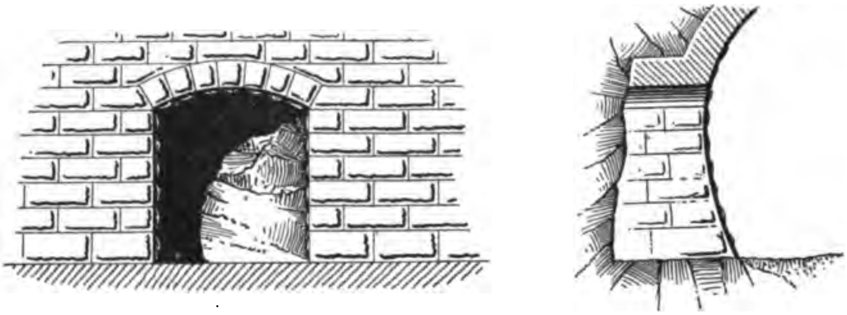


FIG. 11. MASONRY WORK IN TUNNEL.

In the transverse-trench method a trench about 12 feet wide is opened across the street, and in this trench a short length or 'slice' of the subway is built. Owing to the small size of the opening, it is possible to cover it with a timber platform which carries the street traffic during construction. This method was extensively used in constructing the subway at Boston, Mass., and at New York.

SUBMARINE TUNNELING. Submarine or subaqueous tunnels are tunnels excavated under the bed of a river or other body of water, generally for the purpose of providing land communication between the opposite shores. Inflowing water, which is always a serious difficulty in tunnel work everywhere, is here the most serious problem with which the engineer has to deal. Where the tunnel is deep below the stream bed and penetrates a material impervious to water it may be excavated by any of the methods commonly employed in subterranean work. When, however, the opposite conditions exist, resort is had to the use of compressed air or to the shield system or to a combination of the two. In the compressed-air method the forward end of the tunnel where excavation is progressing is filled with air under sufficient pressure to counterbalance the pressure of the water which seeks to enter. In the shield system the work is carried on by the aid of a rather elaborate mechanical device commonly called a shield. The importance of this invention to the tunnel-builder can hardly be overestimated.

The shield devised by Barlow already referred to was greatly improved by Mr. J. H. Greathead, and was first used in building the London Tower tunnel begun in 1869. The remarkable success of this work led to the rapid adoption of the shield system for tunnel work in England and America. Briefly described, the modern tunnel shield is a steel plate cylinder, with its forward edge strengthened and sharpened to form a cutting edge. The rear end extends backward so as to overlap the completed lining of the cast-iron rings. Around its inside hydraulic jacks are attached at frequent intervals so that their piston rods bear against the front edge of the completed lining. By applying power to the jacks their piston rods pass with great force against the immovable lining and thrust the cylinder forward into the soft earth. Generally the cylinder has a vertical position or diaphragm near the front end, which prevents the soft earth from rushing back into it except as it is allowed by opening suitable doors. In operation the cylinder is thrust forward until its sharp cutting edge penetrates the earth a little distance. Workmen then withdraw the earth in small quantities through the openings in the diaphragm. After enough material has been thus withdrawn to leave the front of the shield clear, the shield is again thrust ahead and more earth is removed. As fast as the shield moves ahead the lining is erected under the shelter of its tail end. A constant repetition of these processes completes the tunnel. When the earth is very soft and carries much water, compressed air is often used in connection with the shield. The shield system of tunneling has been extensively used in England and America and to a less extent in most other civilized countries.

NOTABLE TUNNELS. The number of tunnels notable because of their length, the difficulties encountered in their construction or for other reasons, has become so great that mention can be made here of only a few of those which are most celebrated. The Mont Cenis Tunnel through the Alps places France in direct communication with Italy. It passes from a point near Modane, in France, under the Col de Fréjus, about 18 miles west of the actual Mont Cenis, into Italian territory, at a point near Bardonecchia, about 24 miles from Susa. The length of the tunnel between extremities is 7.6016 miles. It is formed with a rising gradient from each end, at the rate of about 1 in 45½ from Modane and 1 in 2000 from Bardonecchia, the summit or meeting of the gradients being half way through the tunnel. The railway does not enter at the extremities of the tunnel, but joins it by means of special curved sections of tunnel at each end. The total length of tunnel traversed by trains is 7.9806 miles. The following is the geological formation of the rock traversed by the direct tunnel advancing from the north end: Carbonaceous schist, 1.3027 miles; quartz, 0.2414 mile; limestone, 0.2210 mile; calcareous schist, 5.8365 miles. The tunnel on leaving Modane is of the following dimensions: 25 feet 3½ inches wide at the bottom, 26 feet 2¾ inches wide in the broadest point, and 24 feet 7½ inches high, the arch being semicircular. At Bardonecchia the height is greater by 11¾ inches and the arch is made elliptical to enable it to resist the greater strain caused by a different inclination of the strata. The tunnel is lined with the exception of about 300 yards on the north side. The side walls are 8 feet 6 inches thick throughout. The arch to the south side is constructed principally of brick, and to the north side of stone, a brick key being applied throughout. There are side paths of flagstones 20 inches wide.

Work was begun in 1857, and for three years hand labor was used entirely, but it was planned from the beginning by the engineers, Sommeiler, Grandis, and Grattoni, to introduce machinery ultimately. In 1861 power drills were put at work at the south end, and in 1862 the north end was similarly equipped. The drills used were operated by compressed air and they and also the compressors used were invented by Sommeiler. The tunnel was completed and opened for traffic in 1872. In 1872, however, work was begun on the *Saint Gotthard* railway tunnel through the Alps between Italy and France, which far exceeded the Mont Cenis in magnitude. This tunnel crosses the mountains between Goeschenen and Airolo, and is 9.25 miles long. The excavation was through rock consisting chiefly of gneiss, mica schist, serpentine, and hornblende, the strata having an inclination of from 45° to 90°. At many points the rock was fissured and disintegrated easily, and water was encountered in large quantities, causing much trouble. In this work, as at Mont Cenis, power drills and compressed air were used, but in a much improved form as a result of the previous experience and years of study. The excavation was lined throughout with masonry, the side walls being of rubble stone and the roof arch of brick. Along the bottom there was a culvert of brickwork. The Mont Cenis Tunnel had been excavated by means of a drift as an advance gallery, but at Saint Gotthard the advance gallery was a top centre heading. Water power, secured by draining near-by mountain torrents, was used to compress the air used in operating the drills and for driving the compressed-air locomotives used in hauling the débris from the excavation. The tunnel was opened for traffic in 1882.

The third great Alpine tunnel is the *Simplon Tunnel*, nearing completion in 1904. Many schemes for the connection of Italy and Switzerland by a railway near the Simplon Road Pass have been devised. The scheme which was put forward in 1881 by the Jura-Simplon Railway consisted broadly of piercing the Alps between Brigue, in the Rhone Valley, and Iselle, on the Italian side, from which village the railway descends to the southern terminus at Domo d'Ossola, a distance of about 11 miles. Starting from Brigue, the new line, running gently up the valley for 1¼ miles, on account of the proximity of the Rhone, enters the tunnel on a curve to the right of 1050 feet radius. At a distance of 153 yards from the entrance the straight portion of the tunnel commences, and extends 12 miles. The line then curves to the left with a radius of 1311 feet before emerging. Commencing at the northern entrance, a gradient of 1 in 500 miles for a length of 5½ miles to a level length of 550 yards in the centre, and then a gradient 1 in 143 descends to the Italian side. The tunnel will be a double tunnel. That is, there will eventually be two parallel tunnels, having their centres 50 feet apart, each carrying one line of railway; but at the present time only one tunnel, that known as No. 1, has been excavated to full size, No. 2 being left, masonry-lined where necessary, for future developments. By means of cross-headings every 220 yards, the problems of transport and ventilation are greatly facilitated. In cross-section tunnel No. 1 is 13 feet 7 inches wide at the bottom, and 16 feet 5 inches wide at the widest part, with a total height of 18 feet above rail-level. The material penetrated is rock. Rotary drills operated by hydraulic pressure were used, there being an elaborate water-power plant at each end of the tunnel.

The three great European railway tunnels which have been described find their nearest counterpart in America in the Hoosac Tunnel, the Stampede Tunnel, and the Cascade Tunnel. The *Hoosac Tunnel* is on the line of the Fitchburg Railroad in Massachusetts, and passes through a southern extension of the Green Mountains known as the Hoosac Mountains. It is 4¾ miles long, and was driven from the two ends and from an intermediate shaft 1028 feet deep. Work was begun originally in 1855 and was carried on intermittently, there being many long delays due to lack of funds and the obstacles encountered. The tunnel proper was completed in 1873, but several additional years were consumed in the masonry work. The cost of the Hoosac Tunnel was about $11,000,000. The tunnel is 24 feet wide in the widest part, and 22 feet 8 inches high, and carries two lines of railway track. The Stampede Tunnel carries the Northern Pacific Railway through the Cascade Mountains, and was begun in 1886. From the time it was determined to make Puget Sound the western terminus of the Northern Pacific Railway, the question of a feasible route across the Cascade Range was prominently before the company. Between the years 1873 and 1884 several proposed routes were examined by the company's engineers, of which those via the Natchess, Stampede, and Snoqualmie passes were prominent. The *Stampede* route, lying between the other two, was finally recommended, and was formally adopted by the company in 1884. Each of the routes named required a tunnel through the backbone of the Cascade Range; but the Stampede route was the longest of the three. The altitude of the mountain beneath which it was necessary to tunnel was 3970 feet above sea-level, and the greatest thickness over the top of the tunnel is 1400 feet, the average depth being about 1200 feet. The elevation of the east portal of the tunnel above the sea is 2827 feet, and that of the west portal is 2800 feet. Work was begun in February, 1886. Probably no other tunnel was ever undertaken where the difficulties and cost of reaching the site and preparing for work were so great as at the Stampede Tunnel. The distance from the nearest railway to the east portal was 82 miles, and to the west portal it was 87 miles, and all men, plant, and material had to be conveyed these distances on wagons and sleds. By the terms of the contract the size of the tunnel was 16½ feet wide and 22 feet high. The method of driving it was as follows: An 8-foot heading was driven along the top of the tunnel and was kept about 30 feet in advance of the bench where the tunnel was excavated to its full width. With the exception of about 500 feet inward from each portal, where the rock was firm and stable, the entire tunnel was timbered as fast as the work progressed. The timbering made it necessary to enlarge the section called for by the contracts to a width of 19½ feet and a height of 23 feet 10 in. The total length of the tunnel was 9850 feet, with a rising grade from each end toward the middle. Power drills operated by compressed air were used. The amount of explosive used was 309,625 pounds. The total cost of the tunnel was $1,160,000.

The *Cascade Tunnel* carries the Great Northern Railway through the summit of the Cascade Range in Washington. This tunnel is of particular interest because of the representative illustration which it affords of modern rock-tunneling methods and machinery in the United States. The crossing of the summit proper of the Cascade Mountains since the construction of the Pacific extension of the Great Northern Railway in 1891-92 was effected by means of a switchback. This switchback was built merely as a temporary line. Business conditions, however, did not justify the construction of a tunnel between 1892 and 1897, but in the latter year orders were given to commence the work and push it as fast as possible to completion. The length of the tunnel is 13,813 feet, of which about 400 feet (or 200 feet at each end) is an extension of the permanent lining, to take the place of the wooden snow shed, but the length of the tunnel proper, from face to face of portals, is 2.61 miles. The width in the clear, inside of the permanent lining, is 16 feet, and the height from top of rail to bottom of arch is 21 feet 6 inches. For the first 500 feet at the west portal, the tunnel was driven through a slide composed of gravel and large boulders. This ground was heavily impregnated with water, and the pressure from above was tremendous. The presence of the large boulders made it difficult to drive poling boards, and a hole a few inches in diameter, if left open, would soon let in sand enough to fill the heading. To carry this heavy ground required three concentric sets of timbers, as well as tie-rods, connecting the wall plates.

The ordinary American system of tunnel excavation was employed. The overhead heading was taken out to the full size of the rock section, 10 × 20 feet, and the bench taken out in two lifts. Rock from the heading and top bench was wheeled in barrows out onto a large traveling carriage called a 'jumbo,' where it was dumped through chutes into the muck cars. Material from the lower bench was shoveled directly into the cars. On a secondary floor, under the main floor of the 'jumbo,' was a hoist operated by compressed air, which was used to load large pieces of rock, some of them weighing six tons, on the flat cars. This obviated the necessity of blockholing large pieces of rock, to enable them to be handled. This cable and hoist was also used to move the 'jumbo' back from the rock face when blasting was to be done. Compressed air, at 100 pounds' pressure, operated drills, hoists, and pumps with the exception of one large pump which was operated by electricity. Four vertical columns in the heading carried six 3¼-inch Rand 'Slugger' drills. From 24 to 28 holes, 12 feet deep, were drilled in the breast, and fired by electricity, in three rounds. Holes were drilled to lift the top bench, and vertical holes for the main or lower bench, enough to break the rock to subgrade. Altogether an average of fourteen 3¼-inch drills were used in each heading and benches.

All hauling out of muck, and hauling in of concrete, was done with electric motors, of which eight were in service. Six of these were constructed at the tunnel machine shop. One of these motors hauled loaded trains of from 16 to 20 dump cars, of 1 cubic yard capacity, up the 1.7 per cent. grade, at 10 miles per hour. The foul air was exhausted from the heading through 24-inch galvanized iron pipe, by means of a No. 9 Sturtevant fan, running at 1700 revolutions.

The tunnel is permanently lined throughout its entire length with concrete, this lining being nowhere less than 23 inches thick, and in places 3½ feet thick. Where the section was larger than would admit of solid concrete, it was backfilled with spawls and broken stone, the result being a monolith of concrete from portal to portal. The tunnel excavation proper was commenced August 20, 1897, and completed October 13, 1900. The average monthly progress in the tunnel was 350 feet; average daily progress 11.53 feet. The work of concrete lining the tunnel was commenced November 17, 1899, and completed November 17, 1900. The average monthly progress was 1115 feet.

Probably the most notable submarine tunnel through rock is that under the river Severn in England, which is known as the *Severn Tunnel*. The Great Western Railway system west of Bristol was formerly separated south of Gloucester by the Severn and its estuary, from the lines between Gloucester and the South Wales ports, as well as from the western lines between Hereford and North Wales, Liverpool, Manchester, and the north. This want of connection was only partly remedied by a steam ferry across the estuary of the Severn. A tunnel under the Severn was, accordingly, proposed in 1871 to provide for through traffic, and was authorized in 1872. Work was begun in 1873. The site selected for the tunnel was about two miles below the mouth of the Wye, where the width of the estuary at high tide is about 2¼ miles. The strata traversed by the tunnel consist of conglomerate, limestone, carboniferous beds, sandstone, marl, gravel, and sand; the least thickness of soil between the top of the tunnel and the deepest part of the channel is 44¾ feet. The total length of the tunnel is 4 miles, 624 yards. The tunnel was excavated from four shafts, work being commenced in 1873 and completed in 1886. Great difficulty was experienced with water, which flooded the workings on several occasions. On one of these occasions a diver was employed to enter the tunnel and close a bulkhead door, which he did by carrying a knapsack filled with compressed oxygen to sustain life during his submarine journey.

Another subaqueous tunnel through rock is the *Mersey Tunnel*, about one mile long, connecting Liverpool and Birkenhead. In this work a ventilating tunnel of smaller size than the main tunnel was excavated under the main tunnel by a rotary boring machine which cut out the passageway to full size at one operation. Except for the Mersey Tunnel, which is a passenger tunnel, all the tunnels previously described are for railway purposes. They are also all rock tunnels.

Among the many important railway tunnels which have been built through soft ground only two will be mentioned. The *Baltimore Belt Tunnel*, 8350 feet long, in Baltimore, Md., was excavated through water-bearing sand, loam, clay, and gravel by the German method of soft-ground tunneling. It provides for a double-track railway line. The *Saint Clair Tunnel* carries the double tracks of the Grand Trunk Railway under the Saint Clair River between Michigan and Canada. In 1886 the Saint Clair Tunnel Company was formed to build this tunnel. Borings showed the materials to be penetrated to be a soft blue clay throughout at the site chosen, which was just below Sarnia and Port Huron. The excavation consisted of an open cutting on the American side 2500 feet long; a tunnel 6000 feet long under the river, and an open cutting on the Canadian side 3100 feet long. Work was begun by means of two shore shafts in 1888, but these were abandoned, and in 1889 work was commenced on the cuttings. These were completed so that shields were started on the tunnel proper in the same year. The shields used were 21½ feet outside diameter, and the cylindrical shell consisted of 1-inch steel plates. The cylinder was stiffened by five diaphragms dividing it into twelve cells. In front the shield had a cutting edge, and at the back it was prolonged 4 feet to cover the lining of the tunnel. As the shield was shoved forward a paste of cement and water was forced out through holes left in the lining to fill the space left between the lining and the clay. The excavation was done in front of the shields, which were then forced forward by hydraulic jacks, and the erection of the permanent cast-iron lining followed up, the ring being erected inside the tail of the shield. There were 24 hydraulic jacks at the back of each shield, each capable of exerting a power of 125 tons, but the greatest total power used did not exceed 1800 tons. The lining is 21 feet in outside diameter. Each ring of lining is 18 inches long, measured on the line of the tunnel, and is made up of 13 segments and a key piece. Each segment weighs 1050 pounds, and the total weight of cast iron in the lining is 27,000 tons. The Baltimore Belt Line tunnel is a fairly representative example of railway tunneling through soft ground on land, and the Saint Clair Tunnel is an equally good example of railway tunneling under water by means of the shield method.

Next to their use for railways, tunnels are more frequently built to conduct water than for any other purpose, perhaps. A good example of rock tunneling for this purpose is afforded by the *Niagara Tunnel*, built to carry the water away from the wheel pit of the Niagara Power Company at Niagara Falls, N. Y. This tunnel is 7600 feet long, 19 feet wide, and 21 feet high, and runs through solid limestone rock. The Chicago water-works tunnels, through which the city of Chicago draws its water supply from Lake Michigan, constitute the most elaborate system of water-supply tunnels anywhere in the world. They comprise 21.97 miles of subaqueous tunnel and 15.92 miles of land tunnel. The subaqueous tunnels are as follows:

	Diameter, ft.	Length, ft.	Cost	Capacity, gallons
Lake View.	6	9,999	$701,792	45,000,000
Chicago Ave....	5	10,567	464,866	170,000,000
	7	10,560	415,709	
	7	10,908	299,897	
Twelfth St. or Four-mile.....	8	9,139	1,104,744	95,000,000
	6	25,200		
Hyde Park or Sixty-eighth St................	7	12,353	741,371	105,000,000
	5	8,132		
	6	5,026		
Northeast..........	10	14,108	610,560	200,000,000
Total (21.97) miles..........	......	115,992	$4,338,939	615,000,000

At Milwaukee, Wis., there is a water-supply tunnel 3200 feet long and 7½ feet in diameter lined with brick masonry throughout, completed in 1895. At Cleveland, O., a water-supply tunnel 26,000 feet long and 9 feet in diameter has recently been constructed, and two other older tunnels are also in use, one being 5 feet in diameter for 6662 feet and 5½ and 6 feet in diameter for 2580 feet, and the other being 7 feet in diameter and 9200 feet long. One of the most notable water-supply tunnels in the world is that which brings water to New York City, and which is known as the *Croton Aqueduct*. (See AQUEDUCT.) This tunnel is 33 miles long and about 14 feet high and 14 feet wide; it was built through rock. The *Vyrnwy Aqueduct*, 77 miles long, for bringing water to the city of Liverpool, England, has three tunnels. The first and longest is the Hirnant Tunnel, 2 miles 3 furlongs in length through solid rock. The second is the Cynynion Tunnel at mile 16. It is seven furlongs long; but the aqueduct only comes out of the tunnel to pass in a siphon across a valley, entering the Llanforda Tunnel, which is one mile long. These tunnels are circular in section and 7 feet in diameter. The third tunnel is that under the River Mersey, which is 805 feet long and lined with iron rings 10 feet in diameter on the outside.

Within recent years many important tunnels have been constructed to carry rapid transit railways under city streets. Some of these, like the London tunnels, have been deep tunnels, but others, like those at Boston, Paris, and New York, have been constructed for the most part by open-cut methods at a small depth below the surface. The *City and South London Railway*, in London, was begun in 1886 and completed in 1890, electricity being ultimately adopted as the means of traction. It is 3⅙ miles long from the city to the Swan at Stockwell, and is entirely underground. Briefly the road consists of two 10 feet 6 inch cast-iron lined tunnels substantially parallel to each other, which converge into a single tunnel at the termini to permit the transfer of trains from one line to the other. These tunnels were constructed by means of the shield system. The *Waterloo and City Railway* in London extends from the Waterloo station of the Southwestern Railway to the Mansion House, a distance of 1 mile 4 furlongs and 150 yards. It consists of two parallel circular tunnels 12 feet 1¾ inches interior diameter except at the curves, where the dimension is increased to 12 feet 9 inches. The tunnels were driven by the shield method, work having been begun in 1894 and completed in

1897. A single electric railway track in each tunnel forms a double-track railway between the termini named. The *Central London Railway* runs from Shepherds Bush to the Bank, a distance of 5¾ miles, the whole distance being in deep tunnel at depths varying from 60 to 90 feet. It consists, like the two roads previously mentioned, of two parallel circular tunnels. Each tunnel is 11½ feet in diameter and has a cast-iron lining. The shield system of construction was employed. To be added to these tunnels are the Metropolitan District railways, parts of which are underground, begun in 1853, the Waterloo and Baker Street Railway, and the projected Euston and Hempstead Railway.

The longest of the London tunnels is the *Blackwall Tunnel* for street traffic under the River Thames. The total length of this work is 6200 feet, of which 3088 feet are tunnel proper, 1370 feet are open cut roofed over, and 1742 feet are open cut without covering. The exterior diameter of the tunnel is 27 feet. It was driven by means of a shield 27 feet 9 inches in diameter and 18½ feet long, with two diaphragms, from horizontal partitions or stages and four vertical partitions. The lining is of cast-iron rings. Work was begun in 1892 and completed in 1897. The tunnel provides a roadway 16 feet wide and two sidewalks each 3 feet 1½ inches wide. In Glasgow, Scotland, the *Glasgow City and District Railway* has a length of 3.123 miles. Of this distance one mile is deep tunnel, and 3483 feet are tunnel built by the open-cut method. Work was begun in 1883 and completed in 1886. The *Glasgow Central Railway* has 0.84 of a mile of deep tunnel and 3.13 miles of open-cut tunnel. The *Glasgow District Subway*, 6½ miles long, consists of two parallel circular cast-iron lined tunnels 11 feet in interior diameter. The tunnels were driven by the shield method. Construction was begun in 1891 and completed in 1894. The *Metropolitan Railway* of Paris, comprising altogether some 40 miles of projected railway, completed in 1900 the main line from the Porte de Vincennes to the Porte Maillot and the Porte Dauphiné, 8.7 miles. This is entirely underground. In the tunnel excavation the Berlier type of shields ordinarily were used; but progress by this means was found too slow, and open, timbered excavation of the ordinary type was employed. The so-called Belgian method of tunneling was used; the arch was first built and then the side walls were erected by underpinning the arch. After the earthen core was removed the bottom arch, or invert, was set in place. At the stations, however, the side walls were first constructed and upon them the arch, or metallic roof, was built. The removal of the earth from the core then took place, as in a tunnel, and the last stage was the construction of the invert. The line is double-track electric railway throughout.

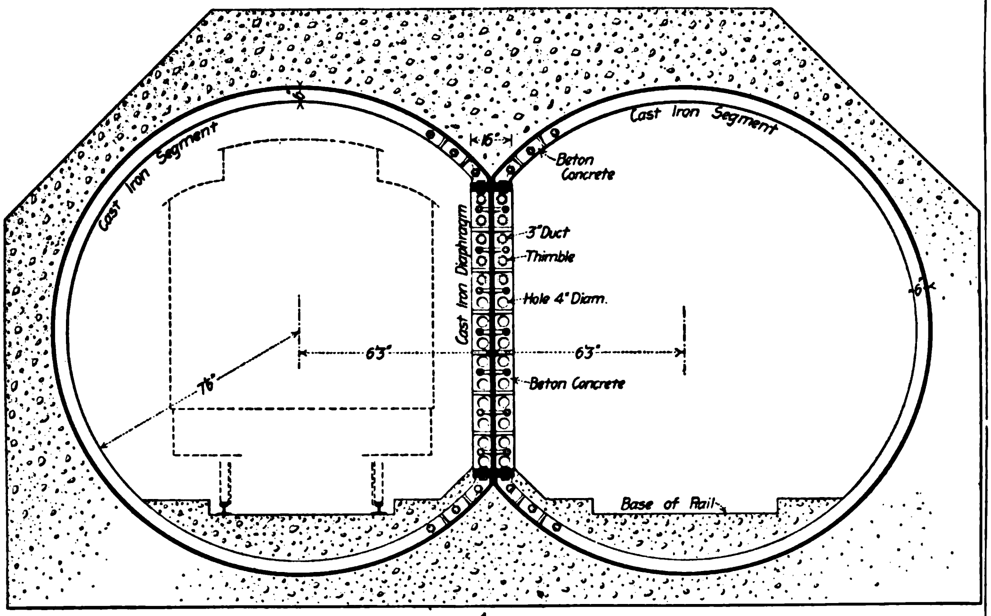
The *Boston Subway*, begun in 1894, is practically the underground tunnel of the surface electric lines entering the business district of the city of Boston. The portion of the line completed in 1898 was 10,810 feet long, divided between double-track and four-track tunnel. The bulk of the tunnel was built by open-cut methods, but on certain portions the shield system was employed. In 1900 work was begun on a 1¼-mile extension of the original line under Boston Harbor to East Boston. The East Boston tunnel has a polycentric cross-section 23½ feet wide and 20½ feet high and is lined with concrete masonry. The double-track subway section is approximately rectangular and 24 feet wide by 14 feet high, while the four-track section is a similar form, but twice as wide. The lining consists of concrete side walls and brick roof arches supported by columns and I-beams of steel.

The *New York Subway*, as contracted for in 1899, comprises some 20½ miles of line, three-fourths of which is in tunnel. A four-track line runs from the City Hall to 103d Street, and there divides into two double-track lines running to Bronx Park and to Kingsbridge, respectively. The cross-section of the underground line is of different types, as indicated on the plate. In the rectangular section used for more than half of the line, the dimensions adopted for two tracks are 25 × 13 feet, and for four tracks, 50 × 13 feet. The barrel-vault section, composed of a polycentric arch, is usually 24 feet wide and 16 feet high. The circular sections are 15 feet in diameter, two tunnels being built side by side for double-track line. The work was done partly by open-cut methods and partly underground, according to the depth of the line below the surface.

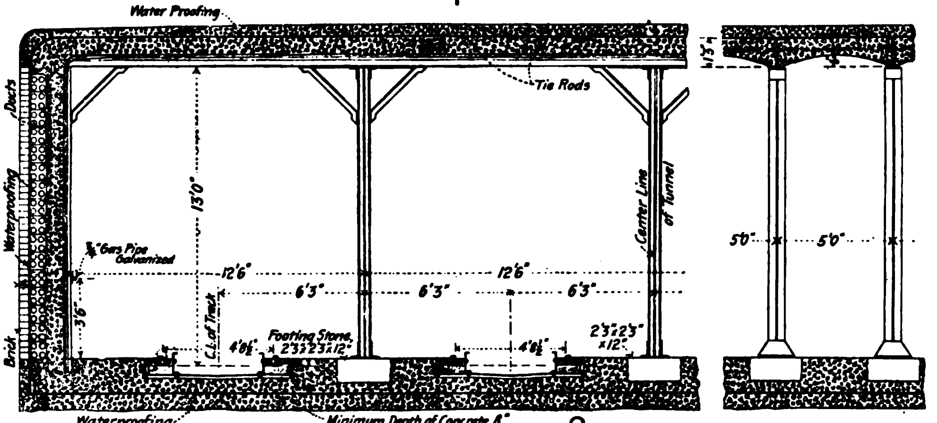
Among other notable tunnels the following may be briefly mentioned: *Arlberg Tunnel*, in Austria, begun in 1880 and completed in 1884 for a double-track railway, 6.38 miles long. *Tequixquiac Tunnel*, begun in 1888 to drain the valley of Mexico, 6 miles long and about 14 feet wide and 14 feet high, completed in 1898. *Trans-Andean Railway Tunnel*, through the summit of the Andes on the railway line between Buenos Ayres and Santiago, three miles long, at an elevation of 10,460 feet above the sea. *First Thames Tunnel* at London, England, begun in 1825 and completed in 1843, 1200 feet long with two parallel ways of horseshoe section, each 13¾ feet wide and 16⅓ feet high. *East River Gas Tunnel*, between New York and Brooklyn, 2516 feet long and 10 feet 2 inches in diameter, begun in 1892 and completed in 1894. *Khojak Tunnel*, on the Northwestern State Railway in India, 12,870 feet long, begun in 1889 and completed in 1891. *Strickler Tunnel*, for the water supply of Colorado Springs, Colo., 6441 feet long, with a section 4 × 7 feet through the rock. *Gravcholz Tunnel*, on the Bergen Railway, in Norway, single track, 17,400 feet long. *Busk Tunnel*, on the Colorado Midland Railway, in Colorado, 9094 feet long, with a section 15 feet wide and 21 feet high through rock.

BIBLIOGRAPHY. The literature on tunneling which is readily available is exceedingly limited. The most comprehensive book on the subject is Drinker, *Tunneling* (New York, 1874), which is now out of print. The book which ranks next in importance is Simms, *Practical Tunneling* (ib., 1896). The most recent book on the subject is Prelini, *Tunneling* (ib., 1901), which is a thoroughly up to date text-book of some 300 pages. Legouez, *De l'emploi du boudier dans la construction des souterraines* (Paris, 1897), is a comprehensive treatise on the shield system of tunneling. Among the works describing individual tunnels are: Von Rosenberg, *The Vorburg Tunnel* (New York, 1887); Walker, *The Severn Tunnel* (London, 1888); Burr, *Tunneling Under the Hudson River* (New York, 1885); Sutro, *The Sutro Tunnel* (ib., 1887).

TUNNELS—TYPICAL SECTIONS OF THE NEW YORK SUBWAY



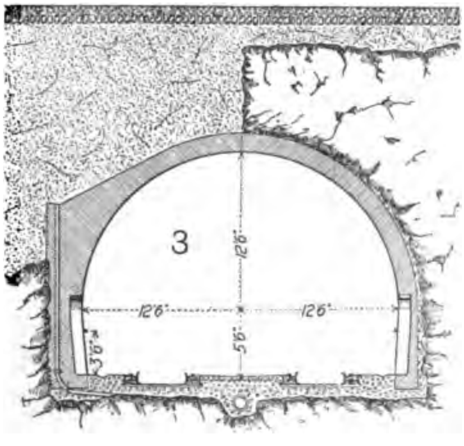
1

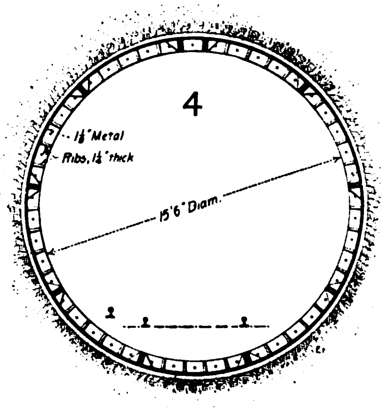


Half Cross Section.

2

Part Longitudinal Section.



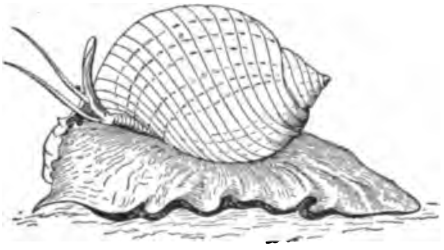


1. Twin single track cast-iron cylinders under Harlem River, showing concrete envelope and lining.
2. Rectangular section, flat roof "I" beam construction. "I" beams are used for roof and sides, steel bulb-angle columns
3. Concrete-arch tunnel. Construction used for rock tunnel and also for some open-cut work.
4. Cast-iron tubes under East River. Constructed in rock by ordinary excavation, in sand and silt by hydraulic shields.

Among foreign books on tunnels the following are notable: La Dame, *Les grands tunnels des Alpes et du Jura* (Paris, 1889); Riziha, *Lehrbuch der gesamten Tunnel-Baukunst* (Berlin, 1874); Danino, *Gallerie della traversata dell' Appennino, nella linea Foglio* (Rome and Naples, 1875). The *Proceedings* of the various societies and the engineering papers contain many descriptions of important tunnel works.

TUNNY (from OF. *ton*, *thon*, Fr. *thon*, from Lat. *thunnus*, *thynnus*, from Gk. θύννος, *thynnos*, θῦνος, *thynos*, tunny, from θύνειν, *thynein*, to dart along), or HORSE MACKEREL. The largest species of mackerel (*Thunnus thynnus*), also called 'tuna,' and 'great albacore.' It has the typical form of mackerel (q.v.), except that its body is thicker, and the tail is widely forked, becoming crescent-shaped. It is pelagic, and occurs in all the warm seas, attaining a length of 10 feet and a weight of 1500 pounds. The flesh, even of the larger specimens, is highly esteemed, and in Southern Europe it has become the object of important fisheries. Tunny fisheries were early established by the Phœnicians, and salted tunny was much esteemed by the Romans. The fish are captured by nets, and in addition to the large sale of them fresh, vast numbers are disposed of by canning. Every part of the body is utilized, the various parts being packed and sold separately, especially in Italy, under distinctive names. A closely related species is the long-finned albacore (*Germo alalunga*), very common in the Mediterranean and widely distributed elsewhere, and extremely abundant in the spawning season on the southern coast of California. It is about three feet long, and very handsome, but its flesh is poor. See Plate of MACKERELS.

TUN-SHELL. One of the large, thin, globose, finely ribbed shells of the gastropod mollusks of the family Doliidæ, closely related to the helmet-shells and cowries (qq.v.). They are mainly tropical, but a well-known one (*Dolium galea*) inhabits the Mediterranean, and becomes ten inches in length, making it the largest mollusk of that region. The fig-shells (q.v.) also belong to this family.



TUN-SHELL.

TUN'STALL. A modern manufacturing and market town in Staffordshire, England, four miles north-northeast of Newcastle-under-Lyme (Map: England, D 3). It has collieries, chemical works, iron foundries, and manufactures of pottery and tiles. The chief building is the town hall. Population, in 1901, 19,490.

TUNSTALL or **TONSTALL**, CUTHBERT (1474-1559). An English bishop and author. He was born at Hackforth, Yorkshire; was educated at Oxford and Cambridge, and studied at Padua; became rector of Harrow-on-the-Hill, 1511; Archdeacon of Chester, 1515, and was appointed Master of the Rolls in 1516, after his return as commissioner to Brussels, where he made the acquaintance of Erasmus and negotiated two treaties with Charles I. of Spain, afterwards Charles V. He was appointed Dean of Salisbury, 1521; Bishop of London in 1522; Lord Privy Seal in 1523; Ambassador to Spain in 1525, and to France in 1527, and became Bishop of Durham in 1530. He was deprived of his bishopric in 1552, and committed to the Tower on a charge of treason; was reinstated by Mary, but, declining the oath of supremacy to Elizabeth, was again deprived in 1559, shortly before his death. He was considered one of the ripest scholars and wisest diplomats of his period, and was the author of various theological and educational works, including *In Laudem Matrimonii, Oratio* (1518); *De Arte Supputandi Libri Quatuor* (1522), an arithmetical treatise frequently republished (1522); and *De Veritate, Corporis et Sanguinis Domini nostri Jesu Christi in Eucharistia* (1551), one of the best contemporary statements of the doctrine of the Eucharist.

TUPAC AMARU II. (1742-1781). A Peruvian revolutionist, whose real name was José Gabriel Condorcanqui, and who has been called 'the last of the Incas,' though it seems he did not himself lay claim to that title. He was born at Tinta (south of Cuzco), and was directly descended from the original Incas. Under the Spaniards he ruled several villages, and in 1780, after failing to get better treatment for the Indians, organized a rebellion in which 60,000 natives joined. During the next three months the insurgents got control of all the country between Lake Titicaca and Cuzco, but in 1781 Tupac was defeated and captured, and with most of the members of his family, was executed with frightful torture, as were also his cousin, Diego, and others of his family. It has been estimated that, during this war, 80,000 Indians were killed, the Spaniards' object apparently being to exterminate the Inca race. Fernando, Tupac's son, was condemned to life imprisonment, and sent to Spain when a child ten years old. His fate is not known, although in 1828, a man calling himself Fernando Tupac Amaru was pensioned at Buenos Ayres, and afterwards was a monk at Lima.

TUPAIA, or **BANXRING.** See TREE-SHREW.

TUPELO (North American Indian name), *Nyssa.* A genus of trees of the natural order Cornaceæ, natives of North America, chiefly of the southern parts of the United States. *Nyssa multiflora*, which attains a height of 60 to 70 feet, is often called black gum tree (q.v.). *Nyssa aquatica*, referred by some botanists to *Nyssa uniflora*, by others to *Nyssa multiflora*, is the large tupelo, a lofty and beautiful tree, remarkable for the extraordinary enlargement of the base of the trunk, which is sometimes 8 to 9 feet in diameter, while at no great height the diameter diminishes to 15 or 20 inches. The fruit (drupe) resembles a small olive, and was preserved in the same way by the French settlers in America.

TUPÍ, to͞o-pē′ (allies, or village), or TUPINAMBA. An ancient tribe from which the widespread Tupían stock (q.v.) takes its name, and whose language is the basis of the *lingoa geral* or Indian trade language of the Amazon region. At the period of the first Portuguese occupation of Brazil, about 1550, they were one of the most populous and powerful tribes of the country, occupying the territory about the mouth of the Amazon and extending far southward along the coast. Being broken and driven back by the whites, they retired from the coast region into the interior, the bands taking different names. In 1640 some of them were still settled, under their own name, along the Lower Amazon from Pará up to the entrance of the Madeira. They cultivated corn and manioc, but lived chiefly by hunting and fishing. Their religion was a simple animism, with but little ceremonial. Those yet remaining in the same vicinity are now called, improperly, Tapuya (q.v.). They are all civilized, quiet, and intelligent. Physically, they are strong and compactly built, and supply the bulk of the crews for the Amazon River trade.

TUPÍAN STOCK, or Tupí-Guarani. The most widespread and important linguistic stock of South America. When the Portuguese took possession of Brazil the Tupían tribes held the greater portion of the territory from the Rio de la Plata (Paraguay or Paraná) on the south to the Amazon on the north, and extended an unknown distance inland, in some places even to the eastern slope of the Andes. The two principal tribes were the Tupí (q.v.), about the mouth of the Amazon, and the Guarani (q.v.), on the Lower Paraguay. Of the numerous other cognate tribes, the most important were the Chiriguano, Guarayo, Múndurucú (q.v.), Mura (q.v.), and Omagua (q.v.). Many of the eastern tribes were gathered into missions by the Jesuits at an early period, the Guarani missions in particular at one time containing more than 300,000 Indians; but through the raids of the slave-hunters and the subsequent expulsion of the Jesuits, the missions were finally broken up, the more civilized Indians remaining to be incorporated with the Spanish settlements, while others retired far into the unexplored western wilderness. In general culture the Tupían tribes as a rule were superior to the other aborigines of Brazil, though much inferior to the Quichua of Peru. They practiced agriculture to some extent, raising corn, manioc, and tobacco, and were expert stone-workers, hammock-weavers, and makers of pottery. They kept monkeys and peccaries for food, but their main dependence was upon hunting and fishing. Their houses were light structures, usually communal, and most of them went entirely naked. With the exception of the Omagua, who had acquired considerable of the Quichua culture, they had no metals. The Tupían languages have been extensively cultivated, the Guarani having been adopted by the Jesuits for use in all the missions of the Paraguay, while the Tupí, in its corrupted form, is still the trade medium throughout the Amazon region. Consult: Adam, *Matériaux pour servir à l'établissement d'une grammaire comparée des dialectes de la famille Tupí* (Paris, 1896).

TUP'MAN, Tracy. In Dickens's *Pickwick Papers*, a susceptible member of the Pickwick Club.

TUP'PER, Sir Charles (1821—). A Canadian statesman. He was born at Amherst, Nova Scotia, where he was educated, and he studied medicine in Edinburgh. He settled in his native place as a medical practitioner; in 1862 was appointed Governor of Dalhousie College, Halifax, and was president of the Canadian Medical Association from 1867 to 1870. In 1835 he had been elected member of the Nova Scotia Provincial Assembly, and for two terms was secretary, and from 1864 to 1867 Premier. He took a prominent part in Canadian federation, and in the building of the Canadian Pacific Railway. After the union he was President of the Council from 1870 to 1872; Minister of Inland Revenue, 1872; Minister of Customs, 1873; Minister of Public Works, 1878; and Minister of Railways and Canals, 1879. In the latter year he was made a Knight Commander of Saint Michael and Saint George, having been a C. B. since 1867. After representing his native county first in the provincial and then in the Dominion Parliament for twenty-eight consecutive years, he resigned in 1884 on proceeding to London as High Commissioner for Canada, an appointment he again received in 1888. He was one of the British plenipotentiaries on the Fisheries Commission at Washington, 1887-88, which effected an agreement concerning the Canadian fisheries dispute, and in 1888 he received the honor of a baronetcy. In 1896 he succeeded Sir Mackenzie Bowell as Premier, but resigned six months later, after the Conservative defeat over the question of religious education. At the general election in 1900 he was rejected by Cape Breton, the scene of his continuous electoral triumphs during forty years, and retired to private life.

TUPPER, Sir Charles Hibbert (1855—). A Canadian Cabinet Minister, born at Amherst, Nova Scotia. He studied at McGill and Harvard universities, and in 1878 was admitted to the bar. In 1882 he was returned to the Dominion Parliament, and subsequently also in 1887, 1888, 1891, and 1896-1900. From 1888 to 1895 he was Minister of Marine and Fisheries, and from 1895 to 1896 was Minister of Justice and Attorney-General. In 1893 he served as agent for the British Government in the Paris tribunal of arbitration on the Bering Sea question.

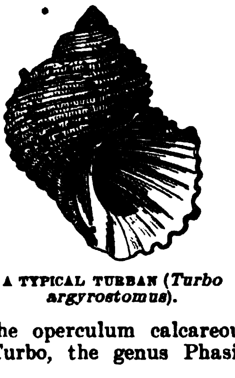
TUPPER, Martin Farquhar (1810-89). An English versifier, born in London. His father, Martin Tupper, was a well-known London surgeon belonging to a German family which had long been settled in Guernsey. Martin was educated at the Charterhouse, and at Christ Church, Oxford. In 1832 he entered Lincoln's Inn, where he was called to the bar three years later. He never practiced law, but turned at once to literature. He twice visited the United States (1851 and 1876). He died at Albury, near Guildford, November 29, 1889. Tupper published thirty-nine volumes. His first work, a collection of poems called *Sacra Poesis* (1832), attracted slight attention. This was followed by *Geraldine* (1838), a ludicrous attempt to complete Coleridge's *Christabel*. In the same year appeared the first installment of *Proverbial Philosophy* in verse. The work was continued and completed in 1876. The earlier parts were enormously popular. Large sections of the poems were also translated into German, French, and Danish. It is now hard to account for this vogue, as the poem is the merest commonplace. Consult the autobiography, *My Life as an Author* (London, 1886), and the reviews in contemporary periodicals, especially *Fraser's Magazine* (October, 1852).

TURACO, tōō-rä′kô (African name). A bird of the African family Musophagidæ or plantain-eaters (q.v.). The species are numerous, of large size and brilliant plumage, and have strong, thick bills, more or less curved on the top, the cutting edges jagged or finely serrated, so as to render them very efficient instruments for cutting soft vegetable substances, on which they feed. The colors are chiefly bright green, verditer-blue, crimson, and yellow; red and green predominate. These birds have an elegant helmet-like crest, which they elevate when excited. One of the largest species is the giant turaco (*Corythæola cristata*) of Western and Central Africa, which is 28 inches long. It is verditer-blue, without red, but the tail has a broad, black, subterminal bar, and the bill is red and yellow.

TURANIAN. A term formerly applied loosely to all Asiatic peoples, excepting those of Indo-Germanic or Semitic stock. In the early Iranian chronicles of the Persian era the term Turan, in contrast with Iran (the home of the Aryan Iranians), was given to the region to the northeast, including modern Turkestan, the home of non-Aryan, nomadic, uncivilized peoples. The theory once put forth according to which, in prehistoric times, Western Asia and most of Europe were peopled by Turanians, whose descendants could be seen in Pelasgians, Hittites, Etruscans, Iberians, Basques, Picts, Finns, and Lapps, has now no currency among the best authorities. The term Turanian still has, however, some scientific currency, although in a much modified sense. Thus De Morgan styles the peoples of the Caucasus Turanians, and Deniker uses the word as synonymous with Turko-Tatars.

In linguistics Turanian formerly had some vogue as a term proposed by Max Müller for all languages of Europe, Asia (excepting China), and Oceania, which are neither Indo-Germanic nor Semitic. The division of these languages into Ural-Altaic or Finno-Ugric, Dravidian, Kolarian, Tibeto-Burman, Khasi, Tai, Mon-Anam, and Malayo-Polynesian is now adopted.

TURBAN-SHELL. An herbivorous scutibranchiate mollusk, closely allied in habits and structure to the top-shell (q.v.). It takes its name from a resemblance in the shell to an Oriental turban, and when denuded of its outer coating is richly pearly, making it one of the shells most widely sold as an ornament. In the Orient, where most of the species live, the animals are often eaten. The aperture is large and flaring, and the operculum calcareous. The typical genus, Turbo, the genus Phasianella (see PHEASANT-SHELL), and the spiny genus Delphinula, constitute the family Turbinidæ, which may be traced back to Ordovician time, and especially flourished during the Silurian period.

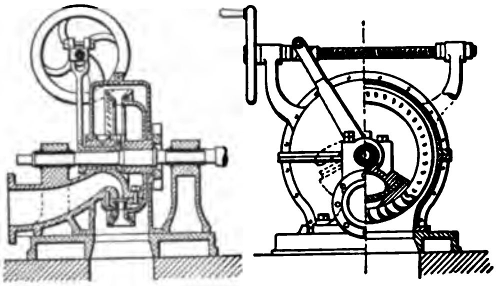


A TYPICAL TURBAN (*Turbo argyrostomus*).

TURBELLARIA (Neo-Lat. nom. pl., from Lat. *turba*, disturbance, crowd; referring to the whirlpools caused by the movements of their cilia). The first and most highly organized of the three classes of flatworms, composed of free-living worms. The body epithelium is densely ciliated. The turbellarian worms are found in both salt and fresh water in the warmer parts of the world, and in moist places on land in the tropics. They are usually of small size, less than two inches long, but some species are four or five inches long. The body is generally very flat and leaf-like, but in some species, especially among the land forms, is narrow, elongated, and slightly arched. The colors are sometimes dull, but many of the marine forms are brightly colored, and are very beautiful objects. Most of the Turbellaria are carnivorous, and are very active, especially in swimming. The class is divisible into three orders, based chiefly on the arrangement of the intestine.

TUR′BERVILLE, GEORGE (c.1540-c.1610). An English poet of an ancient Dorset family. He was born at Whitchurch, in Dorsetshire, and was educated at Winchester, and at New College, Oxford, of which he became a fellow in 1561. Leaving Oxford the next year without a degree, he studied law at one of the inns of court in London. In 1568 he accompanied Thomas Randolph, a special ambassador of the Queen, to Russia, where he wrote verses describing the manners of the people (reprinted in Hakluyt's *Voyages*, 1589). Of his later life nothing is known. He probably died about 1610. Turberville occupies a rather interesting place in English literature, as a translator from the Latin and the Italian, and as one of the first among English poets to employ the ottava rima (q.v.) and blank verse (q.v.). Chief among his works are *Epitaphs, Epigrams, Songs, and Sonnets* (1567, in Chalmers's *British Poets*, vol. ii., London, 1810); *The Booke of Faulconrie, or Hawking*, with which is bound *The Noble Art of Venerie, or Hunting*, ascribed to Turberville (1575; enlarged 1611); *Tragical Tales* from the Italian, with original epitaphs and sonnets (1587; reprinted, Edinburgh, 1837); and *The Heroycall Epistles of Ovidius in English* (1567). To Turberville have been doubtfully ascribed two versions of Tasso's *Jerusalem Delivered* (manuscript in Bodleian Library at Oxford). Selections from Turberville's poems are in *Early English Poetry*, edited by H. M. Fitzgibbon (London, 1887).

TURBINE (Fr. *turbine*, from Lat. *turbo*, *turben*, wheel, whirlwind, from *turbare*, to disturb, move, from *turba*, disturbance, crowd). A motor for utilizing the energy of water by causing it to flow through curved buckets or channels on which it exerts a reactionary pressure constituting the motive force. Turbines may be divided, as regards their construction, into radial, axial, and combined or mixed flow. In *radial turbines* the water in passing through the wheel flows in a direction at right angles to the axis of rotation, or approximately radially. In *axial turbines*, or parallel-flow turbines, the water flows through in a direction generally parallel with the axis of rotation. In *combined or mixed flow turbines,* both the previously described systems are combined. Another classification of turbines is also employed, namely, reaction turbines and impulse turbines. In a *reaction turbine* all parts are entirely filled or 'drowned' with moving water; in the *impulse turbine* the construction is such that the buckets are only partly occupied by the water passing through them, the atmosphere having free access to the remaining space. A reaction turbine is driven by the dynamic pressure of the flowing water, which at the same time may be under a certain static pressure, due to the fact that the inflow takes place under pressure, since the wheel is always filled with water. In the impulse turbine the inflow takes place freely against air pressure only. Most turbines are built on the reaction principle, but any turbine may be made to work either as a reaction turbine or an impulse turbine.


IMPULSE TURBINE.

Structurally, a turbine consists (1) of a ring or a pair of rings, to which are attached curved vanes arranged uniformly around the circumference, revolving on a shaft or spindle to which the ring or pair of rings is connected by a boss and arms or other suitable means, and (2) of a casing which incloses the part just described, and which generally is provided with guide vanes between which the water enters the wheel, and which cause the water to enter in the desired direction. The supply of water to the turbine is regulated by a gate or gates, which can partially or entirely close the orifice where the water enters or leaves. The guides and wheel with the gates and the surrounding cases are made of iron. Numerous forms of turbines with different kinds of gates and different proportions of guides and vanes are on the market. They are made of all sizes from 6 to 60 inches in diameter, and larger sizes are built for special cases. On account of their cheapness, durability, compactness, and high efficiency, turbines are now more extensively used than all other kinds of hydraulic motors. See WATER WHEEL and HYDRAULIC-PRESSURE ENGINE.

The three kinds of turbines, namely, radial, axial, and combined, may be mounted on either vertical or horizontal shafts, and the water may flow through them in both directions. Thus in a radial turbine the water may flow inward from the circumference to the centre, or outward from the centre toward the circumference; in an axial turbine it may flow from the top downward or from the bottom upward; and in a combined turbine it may flow inward and up or down or outward and up or down. Ordinarily turbines are mounted on vertical shafts and water flows through them either inward, outward, or downward. In all cases the water should leave the turbine with low velocity, or, in other words, the most of the energy should have been taken up in passing through the wheel. The three ordinary forms of turbine are often called by the names of those who first invented or perfected them; thus the outward-flow turbine is called the Fourneyron turbine, the inward-flow turbine is called the Francis turbine, and the downward-flow turbine is called the Jonval turbine. Besides these there is the combined turbine, in which ordinarily the flow is usually inward and downward. The usual efficiency of turbines at full gate is from 70 per cent. to 85 per cent. of the power theoretically available.

The speed of rotation of a turbine is regulated by opening and closing the gate which admits the water to the wheel. Where the power used fluctuates the speed will fluctuate unless some method is adopted to adapt the power developed to the power utilized. This is usually done by means of a governor, which is so devised that when little power is being used the resulting increase in speed will actuate it to close partly the gate, and when much power is being used the decrease in speed will actuate it to open the gate wider. The wheel and the shaft which it carries have to be supported from a bearing near the top, but more often they are carried on a sort of point bearing at the bottom. At Niagara Falls the weight of the wheel and shaft is supported by the upward pressure of the water against a disk in the top of the wheel case. For every turbine there is a certain velocity of rotation which gives a higher efficiency and power than any other velocity, and this may be calculated mathematically when the form and dimensions of the vanes and guides are known, or it may be determined experimentally. The theory of turbines is a complicated subject, and the reader interested in investigating it should consult one of the following books: Merriman, *Treatise on Hydraulic Motors* (New York, 1900); Bodmer, *Hydraulic Motors, Turbines, and Pressure Engines* (New York, 1889). A description of a number of the most used turbines is given in Frizell, *Water Power* (New York, 1901). See WATER POWER and WATER WHEELS. STEAM TURBINES are described under that title.

TURBIT. A fancy breed of domestic pigeons, varying in colors and crest, with a flattened head, very small beak, ruffled breast, and other oddities. See Colored Plate of PIGEONS.

TURBOT (OF. *turbot,* from Lat. *turbo,* top). The most valuable of the flatfishes (*Rhombus maximus*), and one of the most toothsome of all fishes. It abounds off the northern coast of Europe, and attains a large size, sometimes 70 to 90 pounds in weight. Its form is shorter, broader, and deeper than that of almost any other flatfish. It is brown in color on the upper surface, which is studded with hard roundish tubercles. Like the other flatfishes, it generally keeps close to the bottom of the sea; and is found chiefly on banks where there is a considerable depth of water. See FLATFISH; and Plate of FLATFISH AND FLOUNDERS.

TURCARET. A comedy by Lesage (1709), satirizing the corruption of the French financiers and the foibles of the time. The title character is an illiterate stock-jobber, whose name has become proverbial for a rich vulgarian.

TURENNE, tụ'rĕn', Henri de Latour d'Auvergne, Vicomte de (1611-75). A Marshal of France. He was born at Sedan, September 11, 1611, the second son of Henry, Duke of Bouillon, and was brought up in the Reformed faith. He entered the French army in 1630, served with distinction under Bernhard of Weimar in 1637-38, and his victory over the Spaniards before Casale in 1640 added to his laurels. He conquered Roussillon from the Spaniards in 1642, and was rewarded with the baton of a Marshal of France. At the close of 1643 he was placed at the head of the army operating in Germany, where the French had sustained a great defeat at the hands of the Bavarians and Imperialists. Together with the Duke of Enghien (later Condé) he fought against General Mercy at Freiburg in August, 1644. After suffering defeat at Marienthal, May 5, 1645, at the hands of Mercy, he shared in Condé's victory near Nördlingen, August 3d. The next year Turenne united with the Swedes to complete the conquest of Bavaria, and by his successes hastened the close of the Thirty Years' War (1648). Under the influence of his elder brother and the Duchess of Longueville (q.v.) he joined the Fronde (q.v.), but, together with his Spanish allies, was defeated by Duplessis at Rethel in December, 1650. In the following year he became reconciled with the Court, and successfully commanded the royal armies against Condé, who had in the meanwhile gone over to the Fronde. In 1667, on the outbreak of the so-called War of Devolution (see Louis XIV.), the King gave him the supreme command of the army, with which he overran Flanders and Franche-Comté. Louis XIV. succeeded in inducing him to embrace the Catholic faith (1668). Turenne's campaign in Holland (1672) was a triumphant one; and the Elector of Brandenburg, who had ventured to side with the Dutch, was forced to sue for peace. In the following campaign, however, Turenne was outmanœuvred by the Imperialist general, Montecuculi. In 1674 he laid waste the Palatinate and defeated the Duke of Lorraine at Sinzheim. Forced from Alsace by superior forces, Turenne executed a masterly retreat, and found safety behind the Vosges Mountains; then in a midwinter campaign he succeeded in reconquering the country after two decisive victories at Mühlhausen and Türkheim. Once more he crossed the Rhine to take up the game against his old rival, Montecuculi, but was killed while reconnoitring before Sasbach, near Offenburg, July 27, 1675. He was buried at Saint-Denis, and his body was placed by Napoleon in the Invalides. Turenne left memoirs of his campaigns from 1643 to 1658, which are of considerable interest to the student of military history (Paris, 1782; new edition 1872). For his biography, consult Armagnac (Tours, 1880), Duruy (5th ed., Paris, 1889), Hozier (London, 1885), and Ramsey (ib., 1774). Consult also: Neuber, *Turenne alse Kriegstheoretiker und Feldherr* (Vienna, 1869); and Roy, *Turenne, sa vie et les institutions de son temps* (Paris, 1895).

TURGAI, tōōr-gī'. A territory of Russian Central Asia, an administrative division of the Governor-Generalship of the Steppes, bounded by the Government of Orenburg (European Russia) on the north, the Territory of Akmolinsk on the east, the Territory of Syr Darya and the Sea of Aral on the south, and the Territory of Ural on the west (Map: Asia, F 3). Area, 176,219 square miles. The larger part is flat, with sandy deserts in the south. The western part is covered with the Mugajar Mountains, offshoots of the Ural system. The region is watered by the Ural and the Tobol, which are almost waterless during the dry season. The flora is poor and the forests are few. The fauna, on the other hand, is very rich, especially in fur-bearing animals. The climate is continental, with extremely hot summers and severe winters.

Agriculture is as yet little developed. The nomadic Kirghizes are engaged principally in stock-raising and hunting. The mineral deposits of the region, which include iron, copper, silver, coal, etc., are practically untouched. The natives export small articles of metal, saddles, musical instruments, carpets, etc. There are also exported furs and animal products. The barter system still prevails. Population, in 1897, 453,123—Kirghizes, over 400,000, and Russians, about 30,000.

TURGENIEFF, tụr-gĕn'yĕf, Alexander Ivanovitch (1784-1845). A Russian historian. He traveled extensively in Germany, Italy, France, and Denmark, making investigations in regard to the mediæval history of Russia. He published *Historiæ Russiæ Monumenta* (2 vols. 1841-42) and a *Supplementum* (1848).

TURGENIEFF, Ivan Sergeyevitch (1818-83). A Russian novelist. He was born at Orel, the son of a wealthy nobleman. At home he learned German and French, besides some English, while a self-taught serf implanted in him a love for the Russian poets. Neglected by his parents, the boy made many friends among the peasants, and became a keen observer of their life. At fifteen he passed a brilliant entrance examination at the University of Moscow, and entered the University of Saint Petersburg a year later. Here he came to know Pushkin, Byelinski, and other literary lights. After graduating, he went to Berlin to complete his study of classical philology under Boeckh and Zumpt, of history under Ranke, and of philosophy under Werder. He returned to Saint Petersburg in 1841. His relations with his mother, formerly strained, were now openly broken off on account of her treatment of the serfs. He had to take service as a Government clerk, but soon gave up his position and set himself to write. His poem *Parasha* (1845) was heartily praised by Byelinski. But it was the great success of *Kolosoff* (1846) and *Khor and Kalinytch* (1847) that induced him to write the *Annals of a Sportsman* (1847-51). These sketches, pervaded with the spirit of humanity and a sincere love for the oppressed peasants, became the favorite book of Alexander II., then heir to the throne. When Turgenieff's mother died in 1850 he immediately liberated all the serfs belonging to the estate. Meanwhile, he had incurred the suspicion of the Government by a sojourn abroad in 1848 and later; and in 1852, after the publication of an article, liberal in tone, on the death of Gogol, he was forbidden to leave his estate. After two years he was pardoned through the influence of powerful friends, and left Russia in 1855. The remainder of his life was spent abroad, mainly in Paris, in close friendship with the famous singer Pauline Viardot-Garcia and her family. Of his few visits to Russia, that in 1879, and especially that in 1880, when he was fêted as no one else at the Pushkin festival, were the most memorable. In 1881 he visited Russia for the last time. He died at his Bougival villa, near Paris, in 1883, and was buried at Saint Petersburg in the Volkoff Cemetery, the funeral procession exceeding anything of the kind previously witnessed in Russia.

The great fame of Turgenieff rests on his *Yakoff Pasynkoff* (1855); *Rudin, Faust* (1856); *Asya* (1858); *Nobles' Nest* or *Liza* (1859); *On the Eve*, or *First Love* (1860), and *Fathers and Sons* (1862). The works of the preceding period were devoted to pleading the cause of the serfs against their owners; in these later works, Turgenieff turned to the mental and moral bankruptcy of the upper classes as resulting from a life of idleness amid hundreds of overworked serfs. *Fathers and Sons* marks an important point in Turgenieff's career. Its hero, Bazaroff, a young student disdaining all but utilitarian science, was called by the author by the newly coined name *nihilist*, meaning 'a man who looks at everything from a critical point of view.' With one or two exceptions the radical critics savagely attacked what was considered a caricature on the young generation. With the reactionaries Nihilism soon became equivalent to 'respect for nothing,' or 'political unreliability,' and this helped to widen still further the breach with the liberals. The animosity of Turgenieff's critics turned the melancholy manifest in his earlier works into pessimism, and his *Smoke* (1867) depicted the whole liberal movement of 'the sixties' as a mirage. *Virgin Soil* (1876) pictured the 'new' generation of 'the seventies.' Here Turgenieff fully applied his favorite division of all people into two types, a classification proclaimed by him in the essay *Hamlet and Don Quixote* in 1860—Hamlet representing endless self-analysis and skepticism; Don Quixote, enthusiastic devotion to the ideal. But Turgenieff, living abroad, could no longer be a faithful painter of the new social currents in Russian life. *Clara Militch* (1883), in spite of its mystical effect, is a story of the real life of the great Russian singer and actress Kadmina, who ended life by suicide on the stage of Kharkoff. His *Senilia*, or *Prose Poems* (1883), are poetic gems in the most perfect prose.

Turgenieff, the lineal literary descendant of Pushkin, is the greatest prose-artist in the history of Russian letters. His figures do not stand out boldly against the background, but form an harmonious organic part of the whole scheme, and as such impress one still more forcibly when the whole scheme is comprehended. The language of Turgenieff has been at once a model and source of despair for the young Russian writers. His influence on modern literature has been very great, and many young French writers consider themselves his pupils. The latest edition of his works appeared in 10 vols. (Saint Petersburg, 1891). An excellent English translation by Constance Garnett appeared in 14 vols. (London, 1894-97), with short introductions to the novels.

TURGENIEFF, Nikolai Ivanovitch (1790-1871). A Russian historian. brother of Alexander Ivanovitch. He studied at Göttingen, entered the civil service, and in 1813 was associated as Russian commissary with Baron Stein in governing the German provinces taken from France. He was afterwards Deputy Secretary of the Interior and Agriculture in Russia. He advocated the emancipation of the serfs, and in 1825 was sentenced to death *in contumaciam*, for his connection with the insurrection of the Decembrists. He lived thenceforth in Paris, where he published *La Russie et les Russes* (1847).

TURGITE (from *Turginsk*, a copper mine in the Ural Mountains). A hydrated ferric oxide that is found massive, with a dull earthy lustre, and is reddish-black to dark-red in color. It is found in the Urals, in Prussia, and in the United States at Salisbury, Conn., where it occurs in large botryoidal masses with limonite. This mineral is regarded as an intermediate stage in the alteration of limonite to hematite by the loss of water, and is a valuable ore of iron.

TURGOR (Lat., a swelling). The condition of a plant cell when it is stretched by the internal pressure of the cell sap. The word is also applied to the stretching force. The mature plant cell usually consists of a protoplasmic body, surrounded by an elastic membrane composed of cellulose and other materials, and inclosing one or more vacuoles filled with water, the cell sap. This is not pure water, but a solution of various substances, whose total osmotic pressure (see Osmosis) is usually equal to 4-6 atmospheres, and sometimes rises as high as 20 atmospheres. Whenever such a cell is surrounded by a solution of lower osmotic pressure, water will enter the cell and find its way to the vacuole. On account of the high osmotic pressure, the protoplasm is driven outward against the cell wall as water enters, and the cell wall itself is stretched (unless this is prevented by the opposing pressure of adjacent cells) until its resilience balances the outward pressure. This stretched state of the cell is favorable for growth (q.v.), and is the opposite of the condition known as plasmolysis (q.v.). Turgor may be reduced by the withdrawal of water from the cell, either by evaporation or by surrounding the cell with a solution of higher osmotic pressure than that inside it. Turgor of all the cells of a tissue renders the mass rigid. By the combined turgidity of all the tissues in the young parts of the plant or those whose cells are thin-walled (e.g. leaves), such parts maintain their normal form. When turgor diminishes, the parts become flaccid.

TURGOT, tụr'gṓ', Anne Robert Jacques, Baron de l'Aulne (1727-81). A French economist and statesman. He was born in Paris, May 10, 1727, of an old family of Normandy, and was destined for an ecclesiastical career, but after studying for a time at the Sorbonne, where he won some distinction, he turned from the Church and devoted himself to the study of jurisprudence and political economy. In these fields he allied himself with the philosophical and liberal thought of his time. He was a contributor to the *Encyclopédie* and became a member of the physiocratic school of economists. He became councilor to the Parlement in 1752, and in 1761 was made intendant of Limoges, administering the affairs of that province for thirteen years, and carrying out within this field such reforms as the ancient prejudices would allow. He introduced a more equitable administration of imposts, and succeeded in abolishing the old method of repairing roads and bridges by the compulsory labor of the poor inhabitants of the district, the corvée (q.v.). He also exerted himself for the protection of commerce. A wider field opened before him when he was called into the Ministry after the death of Louis XV. The finances were in the utmost disorder, and the whole social and political system of France needed regeneration and reform. Turgot was first made Minister of Marine, and afterwards Comptroller-General of France, when to fill that post was to be virtually Prime Minister. His first achievement was so far to reduce the expenditure as to leave a surplus of 20 millions of francs a year to be applied to the liquidation of old debts. He augmented the public revenue without imposing new taxes. One of his first measures was the carrying out of free trade in corn throughout the interior of the kingdom. He aimed at establishing complete freedom of trade within the country, and to make the nobility and clergy contribute to the public revenue in the same proportion as the third estate. He wished, by means of provincial assemblies, to accustom the nation to public life, and prepare it for the restoration of the States-General. But the privileged classes whose exemptions were threatened, nobles, courtiers, farmers of the revenue, and financiers, united against him. The King forsook him, and Turgot retired in May, 1776, having held office for only twenty months. After his retirement he again devoted himself to literary pursuits and to his favorite scientific studies. His most important work, *Réflexions sur la formation et la distribution des richesses* (1766), is one of the chief productions of the physiocratic school. (See PHYSIOCRATS.) His complete works were published in nine volumes (Paris, 1808-11), and have since been reprinted. Consult: Condorcet, *Vie de Turgot* (Paris, 1786); Stephens, *The Life and Writings of Turgot* (1895).

TURIN (It. *Torino*). The capital of the Province of Turin, in Piedmont, Italy, situated on the Po, here navigable near the junction of the Dora Riparia, 76 miles west-southwest of Milan (Map: Italy, B 2). Turin is an open unfortified town. It is unique among Italian cities because of its rectangularity of construction—long, straight, in part arcaded streets, rectangular blocks of houses or 'islands,' and regular squares. It is well built, and is embellished with numerous squares, statues and monuments, and beautiful parks. Several churches have been constructed since 1870, and also four public arcades.

The extensive Piazza Castello, in the northeastern part of Turin, lined by arcaded streets, is the centre of the city's life. Thence the most important thoroughfares diverge, the fine Via di Po (the Corso of Turin) leading southeast to one of the four bridges over the Po, and traversing the large Piazza Vittorio Emanuele. In the Piazza Castello rises the mediæval Palazzo Madama, a huge ungainly pile, now occupied by various institutions. Northward looms the royal palace, a plain brick edifice, dating from 1660. Within it are located the valuable royal armory (with many historic relics of interest), a fine collection of coins, etc. Adjoining the palace is the royal park. Near it stands the commonplace Gothic cathedral (fifteenth century) containing the fine impressive chapel of the Santissimo Sudario, treasuring some of the linen reported to have covered the body of the Saviour. The Palazzo Carignano, in the Carignano Square to the south, in which met the Sardinian Chamber of Deputies (1848-59) and the Italian Parliament (1860-64), holds natural-history collections. The fine square of San Carlo is situated south of the Castello. The gardens of the Citadella, southwest of the royal palace, as well as the gardens of Carlo Felice, to the south, are both attractive. The public park is in the southeastern part of the city, along the left bank of the Po, where are also located the Botanic Gardens. On the eastern side of the Po rises the wooded Monte Dei Cappuccini, 164 feet above the river. A short distance east of the city, on a height ascended by a cable railroad, is the royal burial church of the House of Savoy—the Superga—a splendid edifice affording a fine view. The most important monuments are those of Duke Victor Amadeus I., King Charles Albert, Duke Emmanuel Philibert, and the imposing monument of Cavour.

Turin is industrially and commercially prosperous. It manufactures mainly steel and iron products, silks, lace, velvet, ribbons, cotton and woolen stuffs, jewelry, porcelain, pianos, and furniture. Prominent among the exports are wine and silk from Piedmont. The transit trade is heavy. The opening of the Simplon tunnel promises greatly to favor the city's trade advantages.

Educationally Turin is prominent. (For the university, founded in 1405, see TURIN, UNIVERSITY OF.) The valuable National Library has some 250,000 volumes and 4200 manuscripts. Turin has among its numerous educational institutions a royal polytechnic school, an astronomical observatory (in the Palazzo Madama), a royal military school for artillery and engineer officers, a military school and hospital, a Liceo Musicale, an archiepiscopal seminary, an agricultural school, a philharmonic academy, four gymnasia, and an industrial school. In the Palace of the Academy of Sciences are the picture gallery and museums of antiquities and natural history. There are an Italian Industrial Museum, the civic museum, and the museum of the Risorgimento Italiano, in honor of Victor Emmanuel II. The last is located in the modern Mole Antonelliana, a curious tower-shaped edifice, having a total height of 538 feet, thus overtopping the Cologne Cathedral. The Royal Albertine Library, in the royal palace, contains 60,000 volumes and 3000 manuscripts. The Municipal Library has about 75,000 volumes.

Turin is an important military station, owing to its nearness to the French frontier and to the passes of the Western Alps. The budget in 1900 balanced at about $2,700,000. The municipal debt amounts to $5,270,000, but is more than offset by the value of the municipal properties. The population in 1901 was 335,656.

HISTORY. Turin was the chief city of the Ligurian Taurini. It was taken by Hannibal, and became a Roman colony in the time of Augustus, when it received the name of Augusta Taurinorum. It was prominent under the Lombards, became later the seat of marquises, and in the eleventh century passed to the House of Savoy. It has been repeatedly in the hands of the French. Here Prince Eugene won a brilliant victory over the French on September 7, 1706. From 1861 to 1865 Turin was the capital of the new Kingdom of Italy. Consult: Promis, *L'antica Torino* (Turin, 1871); Borbonese, *Torino illustrata e descritta* (ib., 1884).

TURIN, University of. An Italian university founded in 1405 by Louis of Savoy. It became at once a refuge for the professors at the universities of Pavia and Piacenza, then suffering from civil wars. Toward the latter part of the fifteenth century it shared the general reputation and prosperity of the Italian universities of that period. It comprised two colleges, one founded in 1457 (Collegio Grassi), and one in 1482. The university was reorganized in 1632, and in 1713 the present building was erected. In 1901 there were about 2800 students. The library contains about 260,000 volumes and 3300 manuscripts. There are connected with the university the Collegio Carlo Alberto and the Instituto Dionisio.

TURIN PAPYRUS. A hieratic papyrus, preserved in the Museum of Turin, containing a dynastic list of the kings of Egypt. It formed part of the collection offered for sale to the French Government in 1818, by M. Dovretti, the French Consul-General in Egypt, and was at that time perfectly preserved. The French Government declining to buy it, the papyrus afterwards was acquired by the King of Sardinia, and was finally sent to Turin. It was, however, carelessly packed, and on its arrival it was found to be broken into 164 fragments. Champollion (q.v.) was the first to recognize its nature and value, and in 1824 collected from it between 160 and 180 royal prenomens, but, except in a very few cases, was unable to determine the order of succession. In 1826 Seyffarth (q.v.) attempted to piece together the broken fragments and reconstruct the papyrus, but his attempted restoration is altogether unreliable, partly on account of his limited knowledge of the hieratic character, and partly because a large proportion of the fragments are so minute as to afford little or no indication of their proper order. Subsequent attempts to restore the text have met with little success. In its original condition the Turin Papyrus contained a list of the kings of Egypt, beginning with the mythical period and ending with Dynasties XV. and XVI., with the exact duration of each monarch's reign in years, months, and days. It would supply, if complete, an invaluable guide for the earlier period of Egyptian history, but in its present mutilated state it is of little use for historical and chronological purposes except in the portions covering the thirteenth and fourteenth dynasties, where the text is somewhat better preserved. Elsewhere, the papyrus serves at best to confirm data derived from other sources, and furnishes scarcely any independent information. The text is published in Lepsius, *Auswahl der wichtigsten Urkunden des ägyptischen Alterthums* (Berlin, 1842), and in Wilkinson, *The Fragments of the Hieratic Papyrus at Turin* (London, 1851). Consult: *Transactions of the Royal Society of Literature*, 2d series, vol. i. (London, 1843); *Revue archéologique*, vol. vii. (Paris, 1850); Wiedemann, *Aegyptische Geschichte* (Gotha, 1884-88); Budge, *A History of Egypt* (New York, 1902).

TURK'ESTAN', *Turk pron.* to͞or'ke-stän'. An extensive region in Central Asia, included between the Russian territory of the Steppes on the north, the Mongolian Desert on the east, Tibet, India, Afghanistan, and Persia on the south, and the Caspian Sea on the west. A portion of Turkestan territory is comprised within Afghanistan. Politically the region is divided into Western or Russian Turkestan and Eastern or Chinese Turkestan. The Russian protectorates of Khiva and Bokhara and the Russian Province of Transcaspia are now considered and treated as separate divisions.

Russian Turkestan. This region embraces the territories of Ferghana, Samarkand, Semiryetchensk, and Syr-Darya (Map: Asia, F 4). Total area, about 411,500 square miles; total population, about 4,888,200. Together with the Transcaspian province and a portion of the Pamir, it constitutes the general government of Russian Turkestan. It is bordered by the territory of the Steppes on the north, Sungaria and Chinese Turkestan on the east, Bokhara and Khiva on the south, and Khiva and the Sea of Aral on the west. The western and northern parts are flat and sandy; the southeastern part is mountainous. In the west and north are the great deserts of Kizil-kum, Mujun-kum, and Kara-kum. In the northeast is the extensive Lake Balkhash. The mountains of the south belong to the three systems of the Hissar, the Alai, and Tian Shan, and form a wild Alpine-like district, interspersed with fertile valleys. The Karatau chain stretches northwest and divides the territory into two parts. There are numerous oases. The Syr-Darya, rising on the central mountain border, flows west through the centre of Ferghana, then northwest along the southwestern side of the Karatau, finally reaching the Sea of Aral. The Ili, an affluent of Lake Balkhash, is the chief river in the East. It flows northwest through the centre of Semiryetchensk. These streams have numerous tributaries. The southern section of Russian Turkestan is subject to earthquakes. The climate is continental. The summers are hot and dry and the winters comparatively severe and accompanied by destructive snowstorms. The flora in the west belongs to the Aral Sea district, in the east to the mid-Asiatic region. The fauna, though essentially of the Central Asiatic type, comprises many tropical representatives, among them the tiger. Salt, coal, and asphalt are obtained, and precious stones are exported.

Numerous irrigation canals tap the rivers and provide agricultural conditions which would otherwise be impossible. This is especially true in the southern part of the country, where the bulk of the population is located. The staple crops are wheat, rice, millet, and oats. Cotton is a promising crop in Ferghana. Rice and cocoon silk are also produced in noteworthy quantities. Various kinds of fruit, including the grape, thrive. Stock-raising, however, is the leading occupation. Great numbers of sheep are reared. There are upward of 1,000,000 camels and over 2,000,000 horses in the country. The domestic industries are widespread, and some of the native products, such as carpets and rugs, are highly valued in Europe. The manufacturing industries properly so called are in their infancy. The exports consist chiefly of raw products, which go largely to Russia. The Transcaspian Railway has been a great pacificator in Russian Turkestan. It reached Samarkand in 1888 and at present extends to Tashkent and Andijan. From Tashkent a line is building northwest to Orenburg on the European frontier, and other lines are in contemplation. While the general administration is intrusted to Russian officials, the natives suffer little interference, and taxation is scarcely more than nominal. Public education is almost entirely in the hands of the native religious bodies, although the Russian Government has shown considerable concern for the instruction of the natives. Turkestan forms one educational district, and had, in 1898, 125 schools with 5560 pupils. The inhabitants are almost wholly Mohammedans. The Kirghizes form about 36 per cent., the Sarts 24 per cent., and the Usbegs and Kiptchaks together 19 per cent. The Russians, therefore, constitute but a small element. The leading cities are Tashkent, the capital, Khokand, Namangan, and Samarkand. Andijan was ruined by an earthquake in 1902.

CHINESE OR EASTERN TURKESTAN. A dependency of China, bordered on the north by Sungaria, on the east by Mongolia, on the south by Tibet, on the southwest by Kashmir, and on the west and northwest by the Pamir and Russian Turkestan. The country is isolated and forbidding in many aspects. It is in the main a large and elevated desert plateau, surrounded by lofty mountain ranges, of which the Tian Shan lines the northern frontier, and the Kuenlun, Altyn Tag, and the spurs of the Karakorum the southern. The southern range reaches more than 18,000 feet. The desert of Gobi occupies a portion of the eastern section. The mean elevation of Chinese Turkestan is assumed to be about 3500 feet, but there are a number of markedly low levels, and along the southern face of the Bogdo-Ola mountains, in the depression of Luktchun, the surface drops 200 feet or more below sea-level. The region is watered chiefly by the Tarim River (q.v.), which rises in the west, and its tributaries. The Tashun-Gobi desert occupies the centre of the eastern part. At the foot of the frontier ranges there are chains of oases which mark the chief caravan routes of the region. Along the foot of the Tian Shan stretches a series of lakes, of which the largest is the Bagrach Kul.

The climate is severe and extremely dry. Domestic animals abound, and the tiger, jackal, wild camel, bear, and wolf are found. The oases and the strips along the base of the mountain ranges alone offer conditions for permanent habitation. The people are engaged principally in agriculture, stock-raising, commerce, and hunting. Cotton, silk, and animal products are exported, and in some of the larger cities, such as Yarkand, Khotan, Aksu, and Kashgar, there are manufactured copper-ware, silk, carpet, felt, and leather goods. There are extensive mineral resources, but mining is engaged in only by the natives and accordingly in a primitive way. Asbestos, sulphur, and saltpetre are obtained. A heavy caravan commerce traverses Eastern Turkestan en route to and from China, this region being in the direct central western route. Administratively, Eastern Turkestan has formed since 1885 a part of the Chinese Province of Sinkiang, and is divided into the three *dao-tais* of Kashgar, Aksu, and Urumchi (qq.v.). The seat of the administration is at Urumchi. The inhabitants are of mixed Aryan and Turanian descent. The most numerous are the Kirghizes, Sarts, Kalmucks, Usbegs, and Tajiks. The language is Eastern Turkish with an admixture of Chinese words.

HISTORY. (See BOKHARA, KHIVA, MONGOL DYNASTIES, SAMARKAND, etc.) The invasion of Central Asia by Russia began soon after the conquest of Siberia, and desultory raids on Khiva by pioneers from the north were made as early as the end of the sixteenth century. The expedition into Central Asia sent out by Peter the Great in 1714 ended in disaster, but the submission of the Kirghizes during the eighteenth century gave Russia the territory between the Ural and the Lake of Balkhash. In 1839 a well-equipped Russian army sent against Khiva under the command of Perovski succumbed to cold, hunger, and sickness. By the end of the first half of the nineteenth century Russian forts were established at the mouth of the Syr-Darya and during the following decades a chain of Russian forts was built along the southern frontier. In 1854 a second expedition under Perovski against Khiva met with success. In 1867 the Governor-Generalship of Turkestan was established with Tashkent as the capital. In the following year Samarkand was taken and a treaty of peace was concluded with the Ameer of Bokhara by which Russia acquired a considerable part of the Zerafshan Valley, and Bokhara became practically a vassal State of Russia. In 1873 a Russian expedition forced the Khan of Khiva to cede to Bokhara the Khivan territories on the right bank of the Amu-Darya, which were soon annexed by Russia. In 1876 Russia annexed the Khanate of Khokand (Ferghana). The subjugation of the Tekke-Turkomans was terminated with the capture of Geök-Tepe by Skobeleff in 1881. The Turkomans of Merv submitted in 1884. In 1887 the Afghan boundary was demarcated by an Anglo-Russian commission.

The authentic history of Chinese Turkestan can be traced almost to the beginning of the Christian Era, when the region was partly under the rule of China. Buddhism was then the predominating religion, but there were also sects of Nestorian Christians. In the seventh century the western part of the country fell under the sway of Tibet, whose rule had been extended by the end of the century to the entire region. Islam began to spread over Eastern Turkestan in the tenth century, but even with the conquest of the country by Genghis Khan (q.v.) at the beginning of the thirteenth century there was perfect toleration. It was only with the arrival of the mollahs from Bokhara in the fourteenth century that Islam became a cause of strife, and gave rise to the two factions of White and Black Mountaineers, whose struggles gave China an opportunity to reconquer the country at the end of the eighteenth century. The history of Eastern Turkestan during the nineteenth century is largely made up of repeated attempts on the part of the followers of Islam to wrest the country from the rule of China. From 1872 to 1876 Eastern Turkestan was practically independent under Yakub Beg, but the rule of China was restored soon after his death.

Consult: Schuyler, *Notes of a Journey in Russian Turkestan* (London, 1876); Jaworski, *Turkestan* (in Russian, Saint Petersburg, 1889); Albrecht, *Russisch Centralasien* (Hamburg, 1896); Phibbs, *A Visit to the Russians in Central Asia* (London, 1899); Schwarz, *Turkestan* (Berlin, 1900); Kraft, *A travers le Turkestan russe* (Paris, 1901).

TURKESTAN. A town in the Territory of Syr-Darya, Russian Turkestan, situated about 20 miles east of the right bank of the Syr-Darya, about 180 miles northwest of Tashkent (Map: Asia, F 4). The Mosque of Hazret-Yassavi is a noted place of pilgrimage. Population, in 1897, 11,598.

TURKEY, or THE OTTOMAN EMPIRE (so named from its founder, Othman). An empire in Europe, Asia, and Africa, with its capital at Constantinople. The bulk of the territories over which the Turkish Sultan exercises actual sovereignty is Turkey in Asia, which, exclusive of Arabian possessions, has an area of nearly half a million square miles. A broad strip of country extending the whole length of Arabia along the west coast, and containing Mecca, with an area of about 175,000 square miles, is included within the Ottoman Empire. The European territory actually under Turkish rule (including Novibazar) has an area of nearly 70,000 square miles. Bulgaria (with Eastern Rumelia) is tributary to Turkey. Bosnia and Herzegovina, nominally reckoned a part of the Ottoman Empire, virtually belong to Austria-Hungary. Crete is a vassal State of Turkey and Samos pays tribute to the Sultan. Cyprus virtually passed in 1878 from the possession of Turkey to that of England, which turns over part of the revenues to the Sultan. In Africa Turkish rule extends over Tripoli and Barca (Bengazi), the territory claimed (mainly desert) having an area of about 400,000 square miles. Egypt is tributary to Turkey, but is independent of Turkish rule. The Ottoman Empire, with the various tributary States and alienated provinces nominally reckoned as included in it, has an area in round numbers of about 1,500,000 square miles. The Ottoman domain, owing to internal weakness and external aggression, is in a state of disintegration, and is held together less by the cohesive power of the Turkish Government than by the jealousies of the European powers. This article deals especially with Turkey in Europe. For the other parts of the empire, see the articles on ANATOLIA (Asia Minor), SYRIA, ARMENIA, etc.

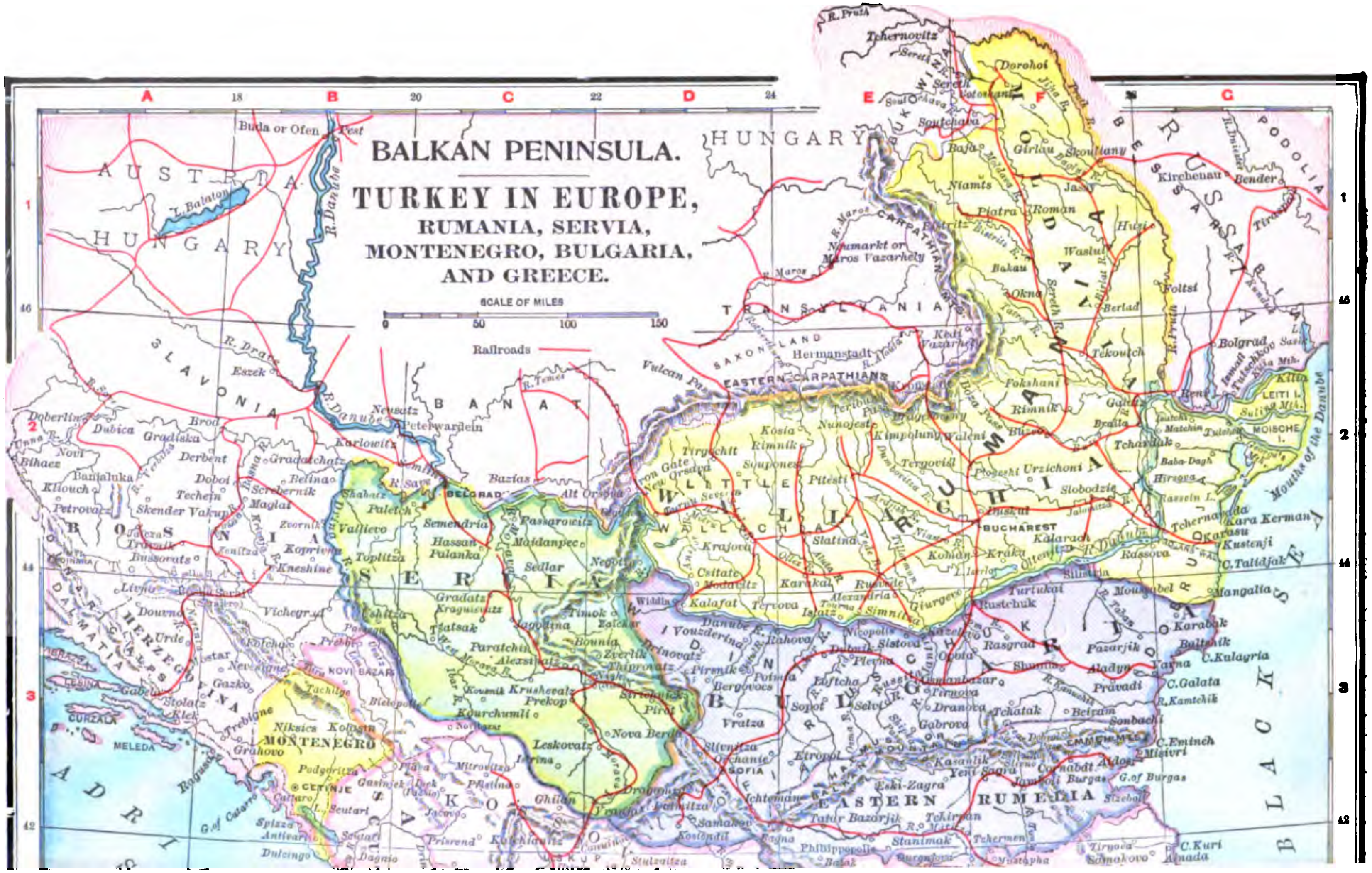
Turkey in Europe embraces about one-third of the Balkan Peninsula. It is bounded on the east and west by the Black and Adriatic seas, on the north by Bulgaria, Servia, Bosnia, and Montenegro, and on the south by the Sea of Marmora, the Ægean Sea, and Greece.

TOPOGRAPHY. Turkey in Europe shares the topographic characteristics of the whole Balkan Peninsula. It is chiefly covered with mountains, which, generally speaking, extend in parallel chains from northwest to southeast, often, however, interrupted by short, transverse ranges. There are no large plains excepting those of the Maritza Valley and the central coastal plain north of the island of Thasos. The greatest elevations are in the west and south. Here the Albanian-Greek Mountains rise in the Shar-Dagh to a height of about 10,000 feet and to a nearly equal altitude in Mount Olympus. Above the low coasts of the Black Sea rise hills of small elevation, west of which is the fertile valley of the Maritza River. West of the Maritza Valley are the Rhodope Mountains or Despoto-Dagh, towering up on the Bulgarian border to a height nearly equal to that of the western mountains. A little to the southwest is the Perim-Dagh, not greatly inferior in elevation. Mount Athos, at the southeast end of the mountainous peninsula of Chalcidice, which projects into the Ægean, rises steeply to a height of over 6000 feet. In the extreme west is the wild and almost inaccessible mountain land of Albania, descending to the marshy and unhealthful coastal plain of the Adriatic.

The coasts are valuable features for the trade of the country, though the Black Sea coast is poor in havens. The winding river-like strait of the Bosporus, which connects the Black Sea with the Sea of Marmora, and through it with the Mediterranean, has ample depth for the largest vessels. Here is the magnificent harbor of Constantinople, the great meeting place of the Eastern and Western trade. On the strait of the Dardanelles, leading from the Sea of Marmora into the Mediterranean, is the harbor of Gallipoli. The Ægean coast abounds in bays and excellent harbors, of which the chief are Dedeagatch, the outlet of the grain exports of the Maritza Valley, and Saloniki, which shares with Constantinople most of the foreign trade. The Adriatic coast, though less irregular, also has good harbors, none of them, however, being of much modern importance.

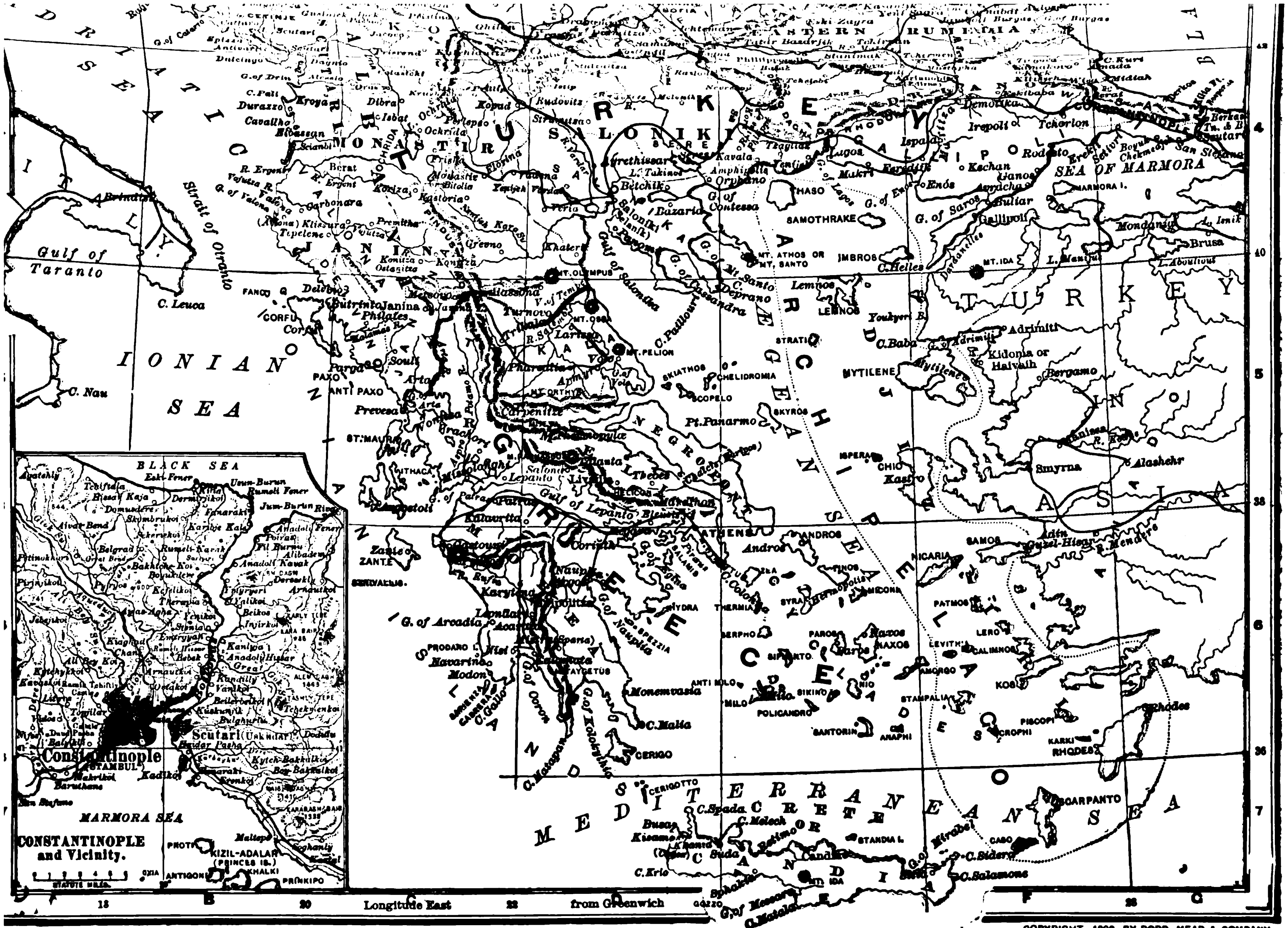
HYDROGRAPHY. The principal rivers of European Turkey are the Maritza, the Struma, and the Vardar, flowing into the Ægean Sea. They are of little use for navigation except the lower part of the Maritza. Their great importance is that their alluvium has converted the valleys into very fertile lands, and these valleys are very useful for communication in connection with the overland routes from Western Europe to Constantinople and Saloniki. In Albania, among the limestone mountains, there are only turbulent torrents forcing their way through wild gorges, like the Drin, flowing into the Adriatic Sea. Scattered among the valleys of Turkey are a few lakes and even extensive marshes, partly filling larger lake basins. The largest lake is Scutari, which projects across the frontier into Montenegro.

CLIMATE AND SOIL. Climatic conditions vary greatly in different parts of the country. The mildest regions are on the Ægean Sea, where in the valleys opening to the south the climate is that of the Mediterranean, with mild winters and with the South European flora, including even cotton. The mountainous regions of the interior, largely cut off from the influence of the sea air, have, on the contrary, a very extreme climate, with cold and snowy winters, when the temperature often sinks below zero F., followed by summers so hot that the snow melts even on the loftiest summits. At Constantinople the mean temperature in January is 43° F., and in July 72.5°. The precipitation on the



BALKAN PENINSULA.

TURKEY IN EUROPE, RUMANIA, SERVIA, MONTENEGRO, BULGARIA, AND GREECE.



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY.

Adriatic coast is heavy the year around, but decreases toward the east and is small in the southeast. The soils are extremely fertile except among the mountains of the western limestone district.

Flora and Fauna. The typical Mediterranean vegetation is luxurious along the Adriatic coast, but is poorly developed in the south, and is entirely lacking in the interior. The climate, however, permits the cultivation on the southern plains and among the mountain valleys of all the Central European plants, while many of those of South Europe thrive along the Ægean plains. The fruits of Central Europe abound in the interior. Many of the mountains are covered with forests. Animals of European, Asiatic, and Mediterranean origin abound; the wolf and bear are found among the mountains, jackals on the southern plains, and buffaloes and fat-tailed sheep are reared on the same farms with ordinary cattle and sheep.

Geology and Mineral Resources. The folded limestone (Dinaric) mountains of Albania extend parallel to the Adriatic coast, showing in many regions the subterranean channels and sink holes peculiar to the Karst. In contrast with these younger folded mountains is the very irregular relief of the intricate mountain region in Thrace and Macedonia, formed of crystalline rocks. In the extreme southeast the whole peninsula on which Constantinople stands belongs geologically to Asia. Its hills are separated from the granitic mountains of Europe by a wide plain covered with recent formations. The rocks on both sides of the Bosporus are Devonian, containing the same fossils, and there is no doubt that this European peninsula was at one time a portion of Asia Minor. Turkey is rich in minerals, especially in the Asiatic provinces, but they are little worked. Considerable manganese ore (45,000 tons in 1898) is mined near Saloniki. In Asia Minor there are mines of chrome, silver-lead ore, copper, antimony, coal, etc. Large quantities of meerschaum are obtained at Eski-Shehr, in Asia Minor. A small royalty is paid on all minerals exported.

Agriculture, etc. Though the inhabitants live almost exclusively by farming and cattle-raising, agriculture is in a very primitive condition. The reasons are the oppressive taxation, which consumes one-third of the harvests, the wretched government, the lack of roads, the low standard of civilization, and the unfavorable division of the soil. As nearly all the land belongs to the Crown or the Church, there is little freehold property, and the peasantry are overwhelmed with poverty. The great ecclesiastical estates (vakuf) are farmed in as primitive a manner as the humblest peasant's leasehold. Fertilizers are rarely applied to the soil. The fact that in spite of these drawbacks the soil is able to produce more than sufficient to meet the wants of the country is proof of the fertility and capabilities of these lands. The chief agricultural productions of Turkey in Europe and Asia are cereals (maize, wheat, and barley being the most important), of which there is usually a surplus for export; wine, figs, and raisins, olives for oil produced on the coasts; roses for the manufacture of attar; tobacco of superior quality; flax, hemp, cotton, opium, and silk. After years of decline the culture of silk in 1896 began to revive, and in 1901 203,675 ounces of silkworm eggs and 11,600,000 pounds of cocoons were produced in the provinces of Brusa and Ismid in Asia Minor. A very small amount of raw silk is consumed in the home industries, the remainder being exported, chiefly to France. Turkey and Bulgaria supply most of the oil of roses in the general trade, and the Turkish production in 1901 was about 5800 pounds. Forestry is entirely unknown, and forests have been preserved only in those districts where the want of roads has made their destruction difficult. Elsewhere wide mountain tracts are perfectly bare and are used for pasturage. Over 3,000,000 acres are still under forests in European Turkey, which is about one-seventh of the forest area of the empire. The raising of live stock is the chief occupation of the inhabitants of the central and western parts of the country. This industry more than meets the local requirements, though little is done to improve the breeds of cattle. The small, but sturdy, Turkish horses are used for riding and as pack animals, and buffaloes for draught purposes. Goats' flesh and mutton are the chief meats consumed, and Albania exports a considerable quantity of wool. The fisheries are prominent, those of the Bosporus alone representing a value of over $1,000,000 a year, while the Mediterranean coast produces sponges of excellent quality, and the Red Sea mother-of-pearl.

Manufactures. The manufacturing industries are chiefly represented by hand-loom weaving and the work of artisans, who transform brass and copper into household utensils. Concessions have been granted for glass manufactures, paper mills, and textile looms, but the numerous attempts to establish factories with Western capital in order to utilize the raw produce of the country have nearly all been wrecked by the pasha system of government and the religious fanaticism of the inhabitants. Constantinople and Saloniki still retain a few steam mills, silk factories, and a factory for fezes, but this national headwear is chiefly imported. Even the few articles in which Turkey formerly claimed preëminence, such as Turkey leather, some grades of silk fabrics, carpets, Turkish yarns, etc., can no longer compete in their own home with the products of foreign factories.

Commerce. The result of the conditions above mentioned is that Turkey is an important market for the manufactures of Western Europe. The Turks are deficient in trading spirit, and both the domestic and the foreign trade are chiefly carried on by Greeks, Jews, Armenians, and other foreigners. In part, Turkey pays for the cotton, the groceries, woolen fabrics, metal goods, general manufactures, and coal and petroleum that it imports with the grain, wool, skins, raw silk, tobacco, wine, southern fruits, gall nuts, attar of roses, leather, and carpets that it sends abroad. The imports are always much larger than the exports. The commercial statistics of Turkey are very unsatisfactory, but the following table shows the approximate amount of its foreign trade, including gold and silver:

	1891	1898	1899
Imports	$100,800,000	$103,100,000	$117,100,000
Exports	56,400,000	64,800,000	59,000,000

The larger part of this trade is with Great Britain, Austria-Hungary, France, Russia, Italy, and Bulgaria. The trade with the United States is very small, but the exports to this country are steadily growing. The following table shows the trade (in millions of dollars) for six fiscal years, each ending on June 30:

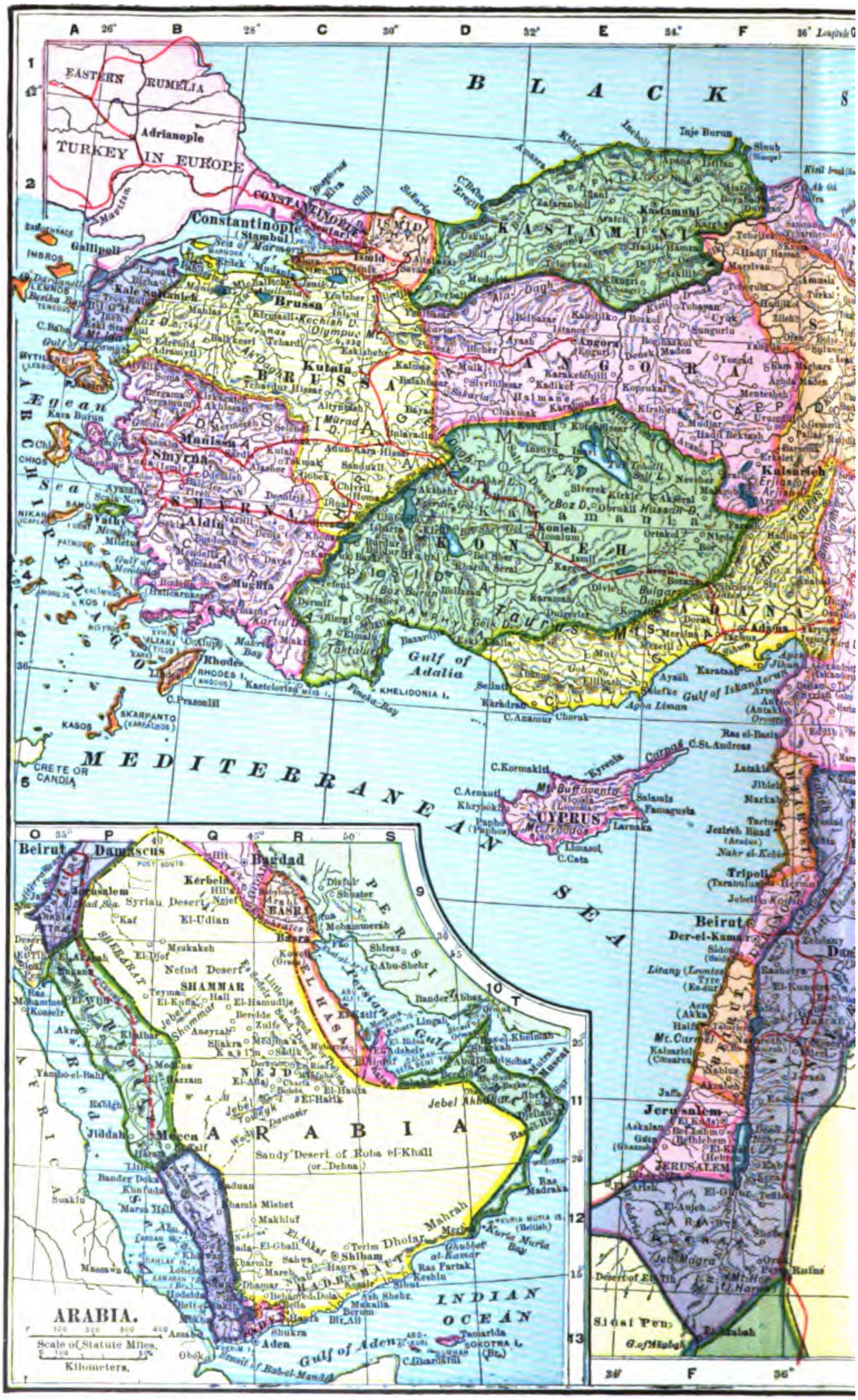
	1898	1899	1900	1901	1902	1903
Imports from U. S...	0.26	0.27	0.25	0.25	0.22	0.49
Exports to U. S.......	2.1	2.4	3.9	3.4	4.9	5.7

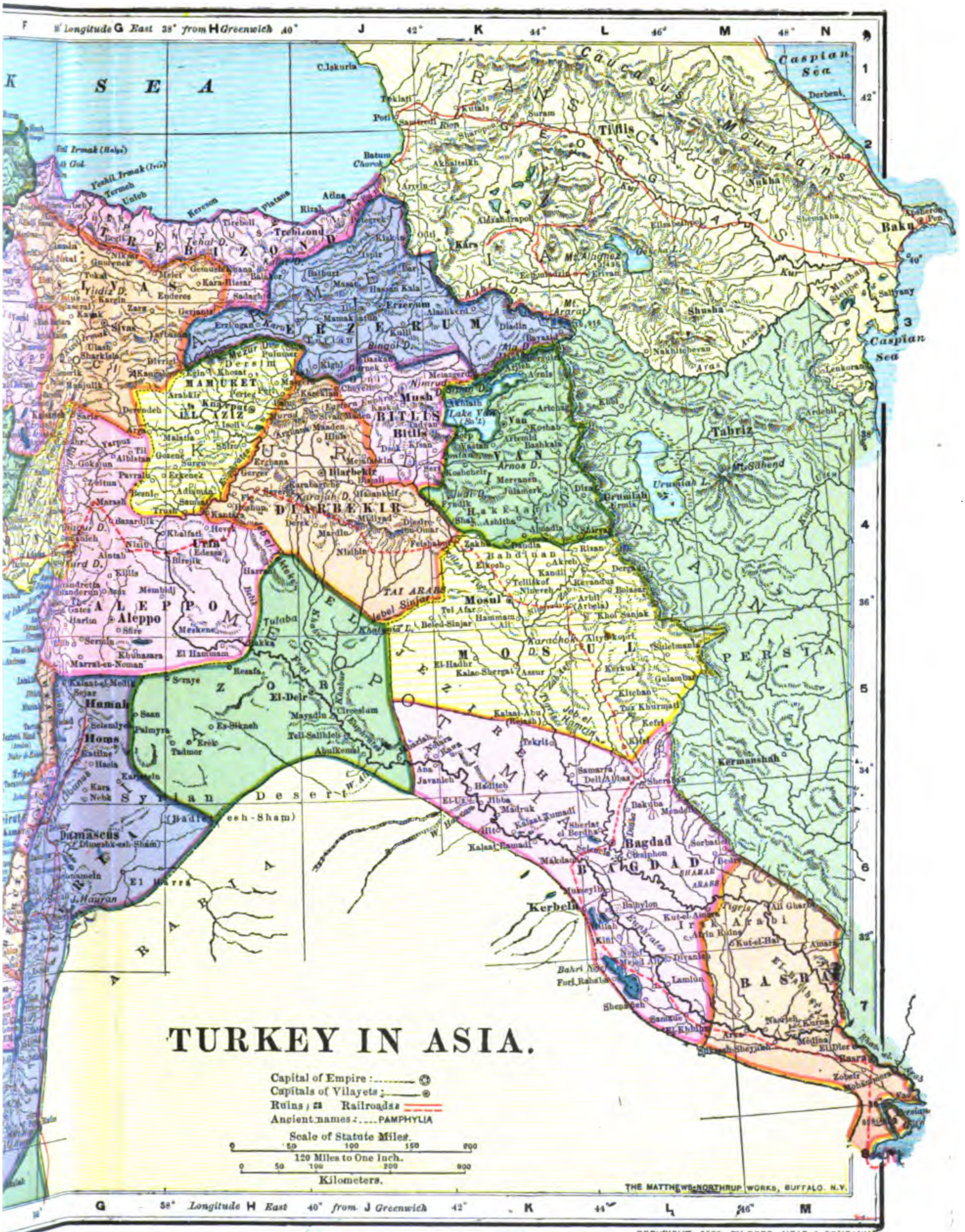
Turkey's exports to the United States are chiefly rugs and carpets, tobacco, hides and skins (goat skins), oils, and wool. The small imports from the United States into Turkey include cotton cloths, provisions, a few agricultural implements, and manufactures of iron and steel. All imports pay a tariff of 8 per cent. *ad valorem* except the Government monopolies, tobacco and salt. A duty of 1 per cent. is collected on all exports except cereals.

TRANSPORTATION AND COMMUNICATION. The chief ports, Constantinople and Saloniki, are in direct rail communication with the rest of Europe by lines extending to Belgrade. There is also a railroad extending westward from the Maritza Valley along the Ægean to Saloniki and thence farther west to Monastir; and a branch road connects Uskub, on the Belgrade-Saloniki road, with Mitrovitza. These railroads, 1269 miles in length, have been a great boon to the internal and foreign commerce of the country, which, however, is still very poorly supplied with means of land transportation. The common roads are scarcely worthy of the name and are used chiefly by pack animals. All land freights are excessive. The maritime trade on the naturally favored south coast is more active. As Turkey's mercantile marine in 1901 included only 107 steamers, of 58,861 tons, and 916 sailing vessels, of 179,883 tons, most of the foreign trade is carried in British, Greek, and other foreign vessels. In the year beginning March, 1897, 188,034 vessels, of 34,332,877 tons, entered and cleared at all the ports of Turkey. Of this number 11,996, of 12,542,149 tons, were employed in the foreign trade and the remainder in the coasting trade. There is a steamship line trading directly between Constantinople and United States ports, which is to some extent stimulating the commercial relations of the two countries.

GOVERNMENT. Turkey is an absolute theocratic monarchy, the executive and religious authority being vested in the Sultan (Padishah), who regards himself as the successor of the caliphs. The succession is vested in the eldest male member of the House of Othman. The form of government takes its inspiration from the Koran and the opinions and sayings of Mohammed, and has been from time to time supplemented by decrees of the various sultans. Attempts to reform the Constitution and bring it into conformity with the constitutions in Western European countries have invariably failed. The will of the Sultan is absolute so long as it does not conflict with the teachings of the Koran. The Sultan is assisted in the administration of affairs by the Grand Vizier, whom he appoints, and who is in turn assisted by a Cabinet of 10 members, consisting of the Ministers of Foreign Affairs, Finance, Justice, War, etc. There are also a Ministry of the Civil List (which has charge of the Imperial domains) and the Ministry of Police. The public functionaries are divided into three classes: those connected with the laws and cults, the governmental department, and the army and navy. The functions of the legislative branch of government are performed by the Sultan together with the Grand Vizier and the Sheikh ul-Islam, who is also an appointee of the Sultan, and is the direct head of the Church. The appointment of the Sheikh ul-Islam, however, is nominally subject to the approval of the Ulema (q.v.), an assembly of the clergy and leading jurists and educators of the Empire. This body is called together by the Mufti (see below). For purposes of local government, the Empire is divided into vilayets (pashaliks), ruled by Valis, or Governor-Generals, appointed by the Sultan. Each Vali is assisted by a provincial council. A few of the provinces are designated as mutessarrifliks. The minor divisions are termed sanjaks, kazas, etc., and are under the supervision of officials appointed by the Valis. The Sultan's subjects possess freedom of their persons and nominally equality before the law. The judicial department is in a sense an adjunct of the executive, all executive officials being vested with authority to perform all duties connected with the administration of justice. The learned class of Turks form three sections: those in the service of the cults (Imam), the law expounders (Mufti), and the judges (Kadi). The ideas and practice of justice, both secular and religious, are based on the Koran, and cases are decided according to the compilation which exists of the decisions that have been rendered during the centuries. The highest court is the Court of Appeals in Constantinople, with two chambers. There may be mentioned also the civil courts, criminal courts, and the commercial courts, whose decisions are based on the Code de Commerce. The commercial courts are formed of a president, two judges, and also two merchant judges selected from the colonies of foreigners. The lack of system and the prevalence of corruption in the judicial branch of government have necessitated measures called 'capitulations,' which provide that all foreigners settled in the country who are accused of crime or misdemeanor shall be tried only before courts presided over by their respective consuls. Litigation between foreigners of different nationalities is heard in the court of the defendant, and cases between foreigners and Turks are tried in local courts, to which the foreign consuls have free access. This affords a guaranty that such trials will be legally conducted.

FINANCE AND BANKING. The country is very heavily taxed by a variety of imposts, which include tithes, taxes on land, personal property, income, and sheep, as well as payments for exemption from military service, etc. Other sources of revenue are the customs, the tobacco and salt monopolies, stamp tax, special taxes on various businesses such as the manufacture of spirits and the fisheries, taxes on silk products, etc. The revenue amounted in 1899 to $81,893,462 and the expenditures to $81,533,341. The total funded and floating debt in 1902 was more than $710,000,000. The Imperial Ottoman Bank, with a


A
26°
B
28°
C
30°
D
32°
E
34°
F
36° Longitude
1
2
5
BLACK
EASTERN RUMELIA
Adrianople
TURKEY IN EUROPE
Gallipoli
IMBROS
LEMNOS
Constantinople
(Stambul)
Sea of Marmora
CONSTANTINOPLE
ISMID
Ismid
Brussa
Kutaia
BRUSSA
Smyrna
SMYRNA
Aidin
Ægean Sea
ARCHIPELAGO
CHIOS
SAMOS
PATMOS
KOS I.
Mughla
Rhodes
RHODES I.
SKARPANTO
KASOS
CRETE OR CANDIA
Inje Burun
Sinub
KASTAMUNI
Kastamuni
ANGORA
Angora
Halmane
KONIEH
Konieh
ADANA
Adana
Tarsus
Gulf of Adalia
Gulf of Iskanderun
MEDITERRANEAN SEA
CYPRUS
Larnaka
Famagusta
Limasol
C.Gata
Kaisarieh
Tripoli
Beirut
Der-el-Kamar
Sidon
Tyre
Acre
Haifa
Mt. Carmel
Jaffa
Jerusalem
JERUSALEM
Sinai Pen.
Desert of Et Tih
G.of Akabah
O
P
Q
R
S
Beirut
Damascus
Bagdad
Kerbela
Syrian Desert
El-Udian
Basra
Bender Abbas
Persian Gulf
EL HASA
SHAMMAR
NEJD
Medina
Mecca
Jiddah
Red Sea
ARABIA
Sandy Desert of Roba el-Khali
(or Dehna)
Jebel Akhdar
Muscat
Ras el-Hadd
Dhofar
Mahrah
HADRAMAUT
Shibam
INDIAN OCEAN
Gulf of Aden
Aden
Mokha
Hodeida
Obok
SOKOTRA I.
Kuria Muria Is.
Suakin
Massowa
AFRICA
ARABIA.
Scale of Statute Miles.
100 200 300 400
Kilometers.
9
10
11
12
13
F
36°



TURKEY IN ASIA.

COPYRIGHT, 1903, BY DODD, MEAD & COMPANY

capital of $48,400,000, had on September 30, 1901, a note circulation of $4,484,000, and cash on hand $10,890,000.

Defense. See under Armies and Navies.

Money, Weights, and Measures. The gold standard is used and the unit of coinage is the piaster—4.4 cents. The national money in the Empire is estimated in round numbers, at: Gold, $150,000,000; silver, $40,000,000. Turkish weights and measures were assimilated to the metric system in 1882, but the change has not generally been adopted.

Population. The estimated population of the so-called Turkish Empire with its tributary States and the other regions nominally included in it was, in 1903, 40,440,957. The population of European Turkey (in the strict sense) is estimated at about 6,000,000, and that of all the countries actually under the rule of the Sultan at about 25,000,000. The population of the Empire without the tributary States is placed at 24,931,600. The largest cities are: Constantinople, Damascus, Smyrna, Bagdad, Aleppo, Beirut, Saloniki, and Adrianople. The list of vilayets and mutessarrifliks with their areas and populations, is as follows:

VILAYETS	Area, sq. miles	Population
In Europe:		
Constantinople	2,702	1,136,000
Adrianople	15,015	1,006,500
Saloniki	13,684	1,165,400
Monastir	10,690	847,400
Kossovo	12,100	961,000
Scutari (Albania)	4,516	322,000
Janina	7,045	648,000
Total in Europe	65,752	6,086,300
In Asia:		
Asia Minor.		
Ismid (mutessarriflik)	4,323	222,800
Brusa (khodavendikyar)	28,486	1,626,900
Bigha (mutessarriflik)	2,625	129,400
Archipelago	2,744	325,900
Smyrna (Aidin)	20,844	1,396,500
Kastamuni	19,184	1,018,900
Angora	26,055	892,900
Konieh	39,779	1,088,000
Adana	14,359	403,400
Sivas	24,240	1,086,500
Trebizond (1898)	11,850	1,163,800
	194,489	9,355,000
Armenia and Kurdistan.		
Erzerum	19,686	597,000
Mamauret-ul-Aziz	13,240	575,300
Diarbekir	13,703	471,500
Bitlis	10,345	398,600
Van	15,517	430,000
	72,491	2,472,400
Mesopotamia.		
Mosul	29,220	300,300
Bagdad	54,503	850,000
Basra	16,482	200,000
	100,205	1,350,300
Syria.		
Aleppo	30,340	995,800
Zor	32,849	100,000
Syria	23,816	955,700
Beirut	11,773	533,600
Jerusalem (mutessarriflik)	8,222	333,000
Lebanon	2,509	399,500
	109,509	3,317,600
Arabia.		
Hedjaz (approximate)	96,500	300,000
Asir, Hodeida, Sana, and Tais (all until recently included in the Vilayet of Yemen)	77,200	750,000
	173,700	1,050,000
Total in Asia	650,394	17,545,300
In Africa:		
Tripoli (approximate)	398,900	800,000
Bengazi "		500,000
Total in Africa	398,900	1,300,000

Total of immediate possessions as above:

	Square miles	Population
In Europe	65,752	6,086,300
In Asia	650,394	17,545,300
In Africa	398,900	1,300,000
	1,115,046	24,931,600

The tributary States and provinces under foreign occupation, with their areas and population according to the most recent census, are:

	Sq. miles	Population
Bulgaria (and Eastern Rumelia)	37,860	3,733,189
Bosnia, Herzegovina, and Novi-bazar	23,570	1,591,046
Crete	3,326	369,253
Samos	180	54,824
Cyprus	3,584	237,022
Egypt	400,000	9,821,045
	465,520	15,746,379

Totals for the Empire: Square miles, 1,583,566; population, 40,677,979.

Education and Religion. Education is greatly neglected, though public schools are established in most of the towns and colleges and public libraries are attached to most of the large mosques. There are no educational statistics. (See under Constantinople.) Only about one-half of the population are Mohammedans, the remainder being Greek and Roman Catholics, Armenians, Jews, etc. There are 2120 mosques in the Turkish Empire, of which 379 are in Constantinople.

Ethnology. The Turkish Empire presents an extraordinary medley of nationalities. The ruling race, the Osmanli Turks, whose blood is greatly mixed with various foreign elements (Slavic, Greek, and Albanian in European Turkey), constitute a minority of the population even in the regions actually under the rule of the Sultan. The only section of the Empire in which they are numerically dominant is the interior of Asia Minor. The most important peoples in Asiatic Turkey after the Osmanlis are the Arabs (Syria, Mesopotamia, Arabia), Armenians (who are found in large numbers outside of Armenia), and Kurds. The Greeks and Jews (in addition to the Armenians) are important elements in the urban population of a large part of Asiatic Turkey. There are less than a million persons of Turko-Tatar blood in Turkey in Europe, and these are chiefly in the portions nearest to Asia. The

Turks form a large element in the population of Constantinople and Adrianople, in the interior of Thrace, and in parts of Macedonia. All the remainder of the population of European Turkey, with a small exception, is divided between Slavic peoples and those belonging to the Mediterranean race, chiefly Greeks in the south and east, and Albanians (Shkipetars) on the Adriatic. The Slavs of Turkey are of Serb and Bulgarian stock. There are a number of Wallachs (Rumans) in the southwest, who are known as Tsintsars. The Jews are numerous in Constantinople and Saloniki, and the Armenians are also well represented in the urban population of European Turkey. The trade of the Turkish Empire is to a great extent in the hands of the Greeks (who carry on much of the sea trade), Armenians, Jews, and Arabs. For the religion of the non-Turkish inhabitants, see ALBANIA, ARMENIA, KURDS, etc.

HISTORY. In the first half of the thirteenth century, at the time of the Mongol invasions under Genghis Khan, a small body of Mohammedan Turks moved westward from their home in Iran, and made their way to Asia Minor. Under the lead of Ertogrul, they entered the service of Ala-ed-Din, the Sultan of Iconium (or of Rum, as the State was known to the Moslems), the last surviving remnant of the great empire established by the Seljukian Turks in Western Asia. Ala-ed-Din granted them some land in Phrygia. The son of Ertogrul, Osman or Othman (1288-1326), laid the foundations of the independent power of his tribe (to which his name became attached) on the ruins of the Seljuk dominion in Asia Minor. Osman's son and successor, Orkhan (1326-59), continued the aggressive policy of his father. He made Brusa, the ancient capital of Bithynia, which had been wrested from the Byzantines, his residence, and gained a foothold in Europe by the taking of Gallipoli (1354). Orkhan was the organizer of the Ottoman power. He exacted a tribute of children from conquered Christian peoples, and these, reared as Mohammedans and trained under rigid military discipline, were organized into that efficient fighting machine, the Janizaries (q.v.). He was succeeded by Amurath I. (1359-89), under whom the Ottoman realm became a European as well as an Asiatic power. At this time, by the side of the declining Byzantine or Greek Empire, the Kingdom of Servia had risen to considerable power. Eastward to the Black Sea, south of the Danube, the Bulgarian czars held sway, and beyond the Danube the principalities of Moldavia and Wallachia had been struggling into existence. Venice and Genoa had extended their power and dominion into the eastern Mediterranean. Amurath I. conquered Adrianople in 1361 and made it his capital. The Turks began to close in upon the Byzantine Empire, and the dominion of Constantinople was reduced to Thrace, Macedonia, and parts of Greece. Amurath greatly extended the Turkish dominions in Asia Minor, and in 1389 he broke the power of Servia in the bloody battle of Kossovo. The Sultan was struck down in the moment of victory and was succeeded by his son, Bajazet I. (1389-1402). Bajazet began his reign with the conquest of Bulgaria and with a war against the Wallachs. A crusading army of Hungarians, Poles, and French, under the command of Sigismund, King of Hungary, was totally routed at Nicopolis in 1396. In 1402 Timur with his Mongol horde swept over Asia Minor, overthrew Bajazet at Angora, and carried him off a captive. On the fall of Bajazet (who died in 1403) there was a struggle for dominion between his sons, which lasted a decade. Finally, in 1413 the youngest son, Mohammed I., found himself in undisputed possession of the whole empire. Amurath II. (1421-51) extended the Turkish dominion over Macedonia, conquered part of Greece, waged fierce wars with the Hungarians, over whom he finally triumphed, and attacked the Albanians, although without success. The most memorable event of his reign was his victory over the Hungarians under King Ladislas III. (q.v.) and Hunyady (q.v.) at Varna in 1444. Mohammed II. (1451-81), the son of Amurath II., prepared immediately on his accession to effect the conquest of Constantinople. The city fell on May 29, 1453, and the Byzantine Empire was at an end. An offshoot from the Greek realm, the Empire of Trebizond, was conquered in 1461, and about the same time the Turks completed the conquest of the Morea. The seat of the Ottoman Empire was transferred from Adrianople to Constantinople. The Turks, merciless as they were toward their conquered foes, allowed the Christian churches to maintain their organization. In 1456 Mohammed II. undertook the siege of Belgrade, the key to Hungary, but the city was delivered by the signal victory of Hunyady. A few years later Servia was incorporated into the Turkish Empire and Bosnia was subdued. In 1470 Negropont (Eubœa) was wrested from the Venetians and in 1475 the Tatar Khan of the Crimea became a vassal of the Ottoman Sultan. Albania, which under the lead of Scanderbeg had long heroically held out against the Turks, was at last subjugated. In 1480 the Knights of Saint John successfully defended Rhodes against a Turkish attack. At this time the Turks obtained a momentary foothold in Italy by the conquest of Otranto. The reign of Bajazet II. (1481-1512), the successor of Mohammed II., was uneventful, but under Selim I. (1512-20) the tide of Ottoman conquest rolled irresistibly eastward and southward. He carried his arms successfully into Persia, conquered Syria (1516), annexed Egypt (1517), and assumed the guardianship of the sanctuary of Mecca, thus proclaiming himself the successor of the caliphs. At this time Moldavia became tributary to the Porte, a position to which the sister principality of Wallachia had been previously reduced.

At the close of Selim's reign, the famous corsair Khair-ed-Din (Barbarossa), who ruled Algeria, placed himself under Turkish suzerainty. Under Solyman the Magnificent (1520-66) the Ottoman Empire stood at the height of its power and splendor. Belgrade was taken in 1521 and Rhodes was conquered in the following year. The victory over the army of Louis II. of Hungary at Mohács in 1526 broke up the Hungarian realm. It was followed by a succession of campaigns against the Hapsburgs, in one of which (1529) Vienna itself was besieged, and which converted the heart of Hungary (including the capital, Buda) into a Turkish province. (See HUNGARY; SOLYMAN II.) Conquests were also made from Persia. On the

Mediterranean Sea the Turks were the undisputed masters. Venice had been gradually stripped of her possessions in the Morea and the Archipelago. Tripoli became subject to Turkey in 1551. Toward the close of Solyman's reign in 1565, a vast Turkish force was beaten back by the heroic defenders of Malta. In the following year the little Hungarian fortress of Szizet long kept at bay the Turkish host which the Sultan had marshaled against the Austrians. Solyman died before the fortress fell. Selim II. (1566-74) undertook to wrest Cyprus from the Venetians and this brought about a Holy League between Venice, Spain, and the Pope, whose fleets inflicted a crushing defeat upon the Turks in the battle of Lepanto (1571). Cyprus, nevertheless, was taken by the Turks. In the reign of Selim II. the subjugation of Yemen was completed, and about the time of his death the Spaniards were driven from Tunis, which became subject to Turkey.

With the disaster at Lepanto the decline of the Ottoman power began. In the line of Osman the first impulse of barbaric vigor had been lost in the effeminacy that attends success. The European nationalities were now establishing their relations on broader grounds of policy and the Ottomon rulers found that diplomacy must in a measure take the place of conquest in the future. Under Amurath III. (1574-95) a war with Persia, in which conquests were made in Armenia, was followed by a contest with Austria, which continued under Mohammed III. (1595-1603) and extended into the reign of Achmet or Ahmed I. (1603-17). At this time Persia rose to a high pitch of power under Abbas the Great, who in 1605 won a great victory over the Turks at Basra, and who wrested large territories from them, even making himself master of Bagdad (1623). The cruel but able and energetic Amurath IV. (1623-40) restored the fortunes of Turkey in the East, retaking Bagdad in 1638. After his death maladministration and internal disorders hastened the decadence of the Empire. In 1656 the Venetians, on whom the Turks had made war for the possession of Crete, appeared in the Dardanelles and defeated the Turkish fleet. The realm was raised for a brief period from this state of depression by the abilities of Mohammed Kiuprili and his son Ahmed (see KIUPRILI), who successively held the position of Grand Vizier during part of the reign of Mohammed IV. (1648-87). They infused fresh vigor into the administration and to some extent enabled the Turkish arms to reassert themselves. A war with Austria, in which the Turks finally suffered a great defeat at the hands of Montecuccoli at Saint Gotthard, on the banks of the Raab (1664), was terminated by a peace slightly advantageous to Turkey. In 1669 the fortress of Candia fell and Venetian rule in Crete came to an end. In the regions to the north of the Black Sea the Turks fought with varying success against the Poles, and it was in the reign of Mohammed IV. that they first came in collision with the rising power of Russia, whose Czar, Feodor II., came off victorious in the conflict. In 1683 the Porte took up the cause of Tökölyi, the leader of the Hungarians in their rising against Leopold I. of Austria, and once more the tide of Moslem invasion rolled up to the gates of Vienna. Kara Mustapha (q.v.), the successor of Ahmed Kiuprili, advanced with a vast army and laid siege to the Hapsburg capital. For a moment the fate of Central Europe hung in the balance, but after the siege had lasted two months, the chivalry of Poland, led by King John Sobieski, and a German army came to the relief of the city, and on September 12th the Turkish army was put to flight in a great battle before its walls. The blow was a crushing one and ended the rôle of Turkey as a formidable aggressive power. Austria, Poland, and Venice now made a great onslaught upon the Ottoman Empire. The Austrians drove the Turks before them in Hungary, capturing city after city. In 1686 Buda, over whose walls the crescent had been displayed for a century and a half, fell into their hands. At the same time John Sobieski overran Moldavia and Wallachia and the Venetians successfully invaded the Morea. In 1695 Peter the Great took up arms against the Turks and in 1696 he wrested Azov from them. The Austrians, under Prince Eugène (q.v.), annihilated the Turkish army opposed to them at Zenta in 1697. In the Peace of Karlowitz in 1699, Turkey was forced to give up all of Hungary between the Danube and the Theiss, to restore to Poland a great part of the Ukraine, acquired in 1672, and to surrender the Morea to the Venetians. In the course of the seventeenth century Turkey had been gradually tightening her hold on Moldavia and Wallachia, which early in the following century were placed under the rule of Fanariot hospodars, appointed by the Porte.

In 1711 Sultan Achmet III. took up arms for Charles XII. of Sweden against Peter the Great of Russia, who had triumphed over his rival at Poltava (1709). The Czar invaded Moldavia, where he was hemmed in by the Turks on the banks of the Pruth, and was glad to purchase peace by the surrender of Azov. In 1715 the Turks reconquered the Morea from the Venetians. The struggle with Austria was renewed in 1716. The Austrian forces under Prince Eugene gained a great victory in the same year at Peterwardein and another in 1717 at Belgrade, which they captured. In the Peace of Passarowitz (1718) the Turks were compelled to cede the Banat, part of Servia (with Belgrade), and parts of Bosnia and Wallachia to Austria. The Morea remained in their hands. In 1736 Russia entered upon her rôle as a great assailant of the Ottoman Empire with the seizing of Azov and the invasion of the Crimea, which were followed by the capture of Otchakov (1737), and a victorious advance into Bessarabia and Moldavia. Austria joined Russia in 1737; but a scheme for the partition of Turkey between the two powers was foiled by the defeats inflicted upon the Austrian armies by the Turks. In the Peace of Belgrade in 1739 Austria relinquished the Servian and Wallachian territories acquired in 1718, while Russia concluded a peace in which she gained but little. Alarmed at the aggressive intervention of the Empress Catharine II. in the affairs of Poland and believing the safety of his realm to be endangered by Russian intrigues, Sultan Mustapha III. ventured in 1768 on a war with Russia, which proved disastrous to Turkey. The Russians advanced victoriously through Moldavia and Wallachia, defeated the Tatar Khan of the Crimea (the vassal of the Sultan), won a victory on the Kagal (in Bessarabia), stormed

Bender, broke into the Crimea, and in 1773-74 advanced into Bulgaria, where, however, the Turkish fortresses withstood their attacks. In 1770 the Russians burned the Turkish fleet at Tchesme. Peace was concluded at Kutchuk-Kainardji in 1774, Turkey renouncing her suzerainty over the Crimea and other Tatar territories in the region of the Black Sea, and according to Russia a sort of protectorate over Moldavia and Wallachia and the free navigation of the Turkish waters. During this war Turkey was to a certain extent crippled by the revolt of the Mameluke Governor of Egypt, Ali-Bey (q.v.). In 1787 Sultan Abdul-Hamid I. plunged Turkey into a fresh war with Russia. Joseph II. of Austria seized the opportunity to make a sudden onslaught on the Turkish territories, and fresh disasters befell the Ottoman arms. Potemkin stormed Otchakov (1788); the allies won a great victory at Fokshani (1789); Belgrade and Bender were captured in the same year; and Ismail was stormed by Suvaroff at the close of 1790, the Russians enacting a carnival of blood. Austria, through pressure from Prussia, withdrew from the struggle in 1791 without reaping any benefit from it, and Catharine II. in 1792 concluded the Peace of Jassy with Sultan Selim III., which made the Dniester the boundary between the Muscovite and Ottoman dominions. Rent by internal disorders, Turkey was unable to offer resistance when Bonaparte in 1798 suddenly swooped down upon Egypt, which, under its Mameluke beys, was already almost severed from the Empire. In Syria the advance of the French was stayed by the brave defenders of Acre (1799). Bonaparte returned to France, and in 1801 the English drove the French from Egypt. The downtrodden Servians rose in insurrection in 1804 under the leadership of Czerny George.

Selim III., under the influence of French thought, had conceived extensive ideas of reform, which he endeavored to put in operation when he ascended the throne. Many of his innovations were premature and he aroused the anger of the Janizaries by his attempts at military reorganization. A revolt forced Selim to abdicate in 1807, and placed his nephew, Mustapha IV. (1807-08), on the throne. Mustapha was soon deposed and Mahmud II. (1808-39) was made Sultan. A war begun by Russia in 1806 was terminated by the Treaty of Bucharest in 1812, by which the country between the Dniester and the Pruth was ceded to Russia. The authority of the Sultan was reëstablished in Servia, but the people rose again under Milosh Obrenovitch and achieved a partial independence. Greece threw off the Turkish yoke in 1821 and after an heroic struggle secured its independence through the armed intervention of the European powers in 1827-29. A revolt of the Janizaries in 1825 was successfully met by Mahmud; in 1826 thousands of the famous corps were slain, and the organization was abolished. Russia waged a successful war against Turkey in 1828-29. General Diebitsch advanced as far as Adrianople, and Paskevitch was equally successful in Armenia. In the Peace of Adrianople (1829) Turkey surrendered to Russia the northeastern coastland of the Black Sea and transferred to her the suzerainty over the tribes of the Caucasus; Russia was accorded a regular protectorate over Wallachia and Moldavia, which for a time were reduced to the position of Russian dependencies. Mehemet Ali, Viceroy of Egypt, who had raised himself to an almost independent position, made war in 1831 on his liege lord, the Sultan. The victories of Ibrahim Pasha (1832) secured to the Egyptian ruler the possession of Syria and Cilicia, while Russia took advantage of the desperate state of Turkey to force upon the Sultan the Treaty of Unkiar Skelessi (1833), which closed the Black Sea to the vessels of war of all nations save Russia. In 1839 Mahmud II. made war upon Mehemet Ali. The Turkish army was utterly defeated by Ibrahim Pasha at Nisib (June 24, 1839), and soon after the Turkish fleet was treacherously delivered up to the Egyptians. Only the intervention of the Quadruple Alliance (q.v.) in 1840 prevented the downfall of the Turkish power. Mehemet Ali was forced to relinquish Syria and other territories; he was recognized as hereditary, though tributary, ruler of Egypt. Soon after the beginning of this war Mahmud II. died (July 1, 1839). His son, Abdul-Medjid (1839-61), continued the reforms commenced in the preceding reign. Russia's truculent attitude brought on a war with Turkey in 1853, in which that country would have suffered severely but for the effective intervention in 1854 of England and France, soon joined by Sardinia, all bent on humbling Russia. The allies of the Sultan made the Crimea the scene of their land operations, and in 1855 Sebastopol fell. (See CRIMEAN WAR.) The Treaty of Paris (1856) restored to Turkey the command of both sides of the Lower Danube, excluded the Czar from his assumed protectorate over the Danubian Principalities (Wallachia and Moldavia), and closed the Black Sea against all ships of war. Wallachia and Moldavia secured almost complete independence and were soon united into the Principality of Rumania. The Porte, adopted into the family of European nations, made a proclamation of equal civil rights to all races and creeds in the Turkish dominions. A massacre of Christians in the Lebanon and at Damascus (see DRUSES) provoked Western intervention in 1860. Abdul-Medjid was succeeded by his brother Abdul-Aziz (1861-76).

The Treaty of Paris in 1856 was supposed to have settled the Eastern question (q.v.) by guaranteeing Turkey's integrity, but Russia was merely awaiting an opportunity to press its old policy, and in 1871 the Russian Government seized the opportunity of war between Germany and France to declare that it felt itself no longer bound by that provision of the Paris treaty which forbade Russia to have a fleet in the Black Sea. A London conference sanctioned this stroke of Russian diplomacy. An insurrection in Crete in 1866-68 was suppressed with difficulty. Between 1854 and 1871 the Turkish debt had increased by nearly $600,000,000; and in 1875 the Porte was driven to partial repudiation of its obligations. An insurrection which broke out in Herzegovina in 1875 served to stir up all the neighboring Slavic peoples and was skillfully encouraged by Russian emissaries. In May, 1876, frightful massacres of Christians in Bulgaria took place. At the close of that month Abdul-Aziz was deposed and soon after was found dead. His nephew, Amurath or Murad V., son of Abdul-Medjid, reigned only three months, when he was deposed as an imbecile, and his brother, Abdul-

Hamid II., succeeded to the throne. In July, 1876, Servia and Montenegro declared war against the Porte. Before the end of the year the Servians were utterly defeated, in spite of the help of many Russian volunteers. The state of affairs in the Turkish provinces seemed to call for a conference of the Great Powers at Constantinople. The proposals then made for the better government of the Christian subjects of Turkey were rejected by the Grand Council of the Turkish Empire. Simultaneously, however, with the assembly of the conference the Turkish Government had taken the extraordinary step of bestowing a parliamentary constitution on the Ottoman Empire. The Parliament assembled in March, 1877, but this ostensible remodeling of the political fabric of the Empire did not get beyond its incipiency. Russia took it upon herself to enforce on Turkey the demands made by the Powers, and on April 24, 1877, declared war. (See RUSSO-TURKISH WAR.) The Turks made a brave stand, but at last succumbed, and at the close of January, 1878, the Russians were almost before the walls of Constantinople. The Treaty of San Stefano was signed on March 3d, but the European Powers intervened and readjusted the whole Eastern question at the Congress of Berlin, Russia being forced to content herself with a much less radical disruption of the Turkish Empire in Europe than she had sought to bring about. See BERLIN, CONGRESS OF.

For a few years under the settlement effected at Berlin, there was comparative quiet in the Ottoman dominions, although in 1883, in consequence of disturbances in Egypt, and the bad condition of the finances in that province, Great Britain established a control there which practically nullified what little was left of the Ottoman sovereignty. Following on a revolutionary movement at Philippopolis in September, 1885, the Prince of Bulgaria proclaimed the annexation of Eastern Rumelia, and after a decade the Porte was compelled to recognize the change which thus deprived it of its fairest province. In 1895-96 there were massacres of tens of thousands of Armenian Christians, which were connived at by the local officials of the Ottoman Government. The protests of Europe were of no avail, because Abdul-Hamid knew well how to play off the Powers against one another so as to prevent interference of an effective kind. A rising of the Christians against the Mohammedans in Crete (q.v.) followed in 1896, and was the signal for the outbreak of long-repressed hostilities in Greece, which recklessly entered upon war with Turkey in April, 1897. The campaign of a few weeks showed the utter futility of the Greek preparations. (See GREECE.) Greece was forced to sue for peace, the terms of which provided for the payment to the Ottoman Government of an indemnity of $18,000,000, and the rectification of the Greco-Turkish frontier in favor of Turkey. Meanwhile Crete was taken in charge by Great Britain, Russia, France, and Italy, and a settlement was finally made in 1898 by which the suzerainty of Turkey was renewed, but the island was given an autonomous government for three years, its executive head being Prince George of Greece, as high commissioner of the four Powers. This settlement was renewed indefinitely upon its expiration in December, 1901. (See CRETE.) The peoples of ancient Macedonia have long been restive under Turkish control, and in 1903 there were bloody conflicts and massacres over a large territory. The rivalry of Bulgaria and Greece and the influence of the Great Powers have made a successful revolt difficult.

BIBLIOGRAPHY. Lejean, *Ethnographie de la Turquie d'Europe* (Gotha, 1861); Reclus, *Géographie universelle*, vol. i. (Paris, 1876); Von Samo, *Die Völker des osmanischen Reiches* (Vienna, 1876); Clark, *The Races of European Turkey* (Edinburgh, 1878); Geary, *Asiatic Turkey* (London, 1878); Keene, *The Turks in India* (ib., 1879); Isambert, *Grèce et Turquie d'Europe* (Paris, 1881); Lozer, *Turkish Armenia and Eastern Asia Minor* (London, 1881); Vámbéry, *Das Türkenvolk* (Leipzig, 1885); Ramsay, *Historical Geography of Asia Minor* (London, 1890); Garnett, *The Women of Turkey and Their Folklore* (ib., 1890-91); Cuinet, *La Turquie d'Asie: Géographie administrative* (Paris, 1891-98); Georgiadès, *La Turquie actuelle* (ib., 1892); Knight, *Where Three Empires Meet* (London, 1893); Latimer, *Russia and Turkey in the Nineteenth Century* (Chicago, 1893); Salmoné, *The Fall and Resurrection of Turkey* (London, 1896); Macoll, *The Sultan and the Powers* (ib., 1896); Lunay, *Chez les Grecs de Turquie* (Paris, 1897); Lobel, *Hochzeitsgebräuche in der Türkei* (Amsterdam, 1897); Steevens, *With the Conquering Turk* (London, 1897); Ramsay, *Impressions of Turkey During Twelve Years' Wanderings* (New York, 1897); Kaunenberg, *Kleinasiens Naturschätze* (Berlin, 1897); Bérard, *La Turquie et l'Hellénisme contemporain* (Paris, 1897); Davey, *The Sultan and His Subjects* (London, 1897); Fazy, *Les Turcs d'aujourd'hui* (Paris, 1898); La Barre de Nanteuil, *L'Orient et l'Europe depuis le XVIIème siècle* (ib., 1898); Bernard, *Turquie d'Europe et Turquie d'Asie* (Paris, 1899); Kaudor, *Reisebilder aus Persien, Turkestan und der Türkei* (Breslau, 1900); Percy, *The Highlands of Asiatic Turkey* (ib., 1901); Creasy, *History of the Ottoman Turks* (London and New York, 1877); Freeman, *The Ottoman Power in Europe, Its Nature, Its Growth, and Its Decline* (ib., 1877); Von Hammer-Purgstall, *Geschichte des osmanischen Reichs* (10 vols., Pesth, 1827-35, containing a great body of documents; a second revised edition, without the documents, 4 vols., Pesth, 1836), the standard authority; Zinkeisen, *Geschichte des osmanischen Reiches in Europa* (7 vols., Gotha, 1840-63), another standard work, better than Hammer for the general reader; Lane Poole, *Story of Turkey* (New York, 1888); Rosen, *Geschichte der Türkei neuester Zeit* (2 vols., Leipzig, 1866-67); Hecquard, *La Turquie sous Abdoul Hamid II.* (Paris, 1901); Seignobos, *Political History of Europe Since 1814*, translated by Macvane (New York, 1900).

TURKEY (abbreviation of *Turkey-cock*, *Turkey-hen*, so called as being supposed to come from Turkey, vaguely applied to Tartary or Asia in general). The turkeys are natives of North and Central America, and the only two species known are the common wild turkey (*Meleagris gallopavo*) with three subspecies and the beautiful Yucatan turkey (*Meleagris ocellatus*). They were once regarded as a distinct family, but are now considered the sole American representatives of the Phasianidæ. The wild turkey is like the domesticated one, but more brightly colored. The ocellated turkey of Central America is a smaller and more beautiful species; the plumage is lustrous, and parts of it are ocellated, like the peacock's feathers; the bare head is blue with orange caruncles. This fine species is confined to Yucatan and Central America. The common wild turkey is still found in Mexico, Texas, and Arizona, and in other parts of the West and South, but is scarce east of the Mississippi and north of Virginia or Kentucky, though it formerly ranged well up into New England.

The domestic turkey, the largest of gallinaceous birds, appears to have been introduced into Europe by the Spaniards early in the sixteenth century. The domestic birds vary greatly in plumage from the tints of the wild species to buff, or brown, or pure white, and occasionally produce a crest. On account of its size, and the excellence of its flesh and eggs, the turkey is one of the most valued kinds of poultry. The management of turkeys differs little from that of the common fowl. The young are tender for the first few weeks, and require care, particularly to keep them from getting wet by running among the wet grass, or the like; but afterwards they are sufficiently hardy. See Colored Plate of PEACOCK, TURKEY, AND GUINEA-FOWL.

TURKEY BUZZARD. See VULTURE.

TURKEY GNAT. An insect (*Simulium pictipes*) of the dipterous family Simuliidæ, identical with the Southern buffalo-gnat, which usually makes its appearance about the time turkeys are setting, and sometimes causes great mortality among those birds. See BLACK FLY; BUFFALO-GNAT.

TURKEY RED. A name applied to one of the most durable and beautiful colors which have been produced on cotton. The process of dyeing cotton Turkey red is said to have been practiced in India from time immemorial; at present, the main seat of the industry is in the neighborhood of Glasgow. The operations are long and tedious, and their effect could scarcely be explained theoretically. Thus no reason could be given for the part of the process which consists in soaking the cloth in olive oil for a considerable length of time; yet this is well known to be one of the most essential operations in the dyeing process and is believed to be the cause of the rich appearance of the dye. Turkey red is one of the colors of alizarin which can be obtained either from madder (*Rubia tinctorum*) or by an artificial process of manufacture from coal-tar. See ALIZARIN.

TURKEY STONE. A honestone found in Turkey. See HONES.

TURKISH LANGUAGE AND LITERATURE. The Turkish language belongs to the Finno-Ugrian linguistic group, where it holds a first place for conformity to type as well as for extent of domain. Its territory is a zone averaging about 300 miles in width, extending along the fortieth parallel of latitude from the shores of the Adriatic Sea eastward through one hundred degrees of longitude to the westward border of Manchuria.

The chief structural characteristics of the Turkish language are four: (1) The root of every word is inviolable; (2) the root is emphasized by making its leading vowel dominate the vowels and to some extent the consonants added for purposes of inflection, subjecting them to change under regular rules of euphonic harmony. (3) Grammatical forms, especially in the conjugation of the verb, are abundant, regular, logical, and efficient. (4) Determining or modifying syllables are placed at the end of the root. The Turkish verb begins in simplicity. For instance, *bak* means 'look thou,' and is the root of the verb *bakmak*, to look. Upon this root a series of new verbs may be built: (1) Causative: *bakdirmak*, to cause or allow to look; (2) reciprocal: *bakishmak*, to look at one another; (3) reflexive: *bakinmak*, to look at one's self, i.e. to be perplexed. From these again a further series of new verbs can be made by inserting in each the causative particle: (4) *bakdirtmak*, to make or let one cause another to look; (5) *bakishdirmak*, to cause or allow one to look at another; (6) *bakindirmak*, to cause or allow one to look at himself, i.e. to be perplexed. All of these new verbs can be conjugated in the positive, the negative, and the impossible form (to look; not to look; and not to be able to look), and, if the sense permits, in all the moods and tenses of the active and passive voices. The same is true of the root of every verb in the language, if the sense permits. It has been computed that, counting all the moods and tenses and numbers and persons, the permutations of which each Turkish verb is capable amount to over 25,000. Yet so simple and clear are the rules that the memorizing of forty-four syllables or particles enables one to build and understand the whole series. The efficiency of the system appears on realizing that Turkish grammar has but one conjugation and no irregular verbs except the auxiliary. The scheme of the verb is that of a form which will fit every root and which is yet so transparent that the root is always visible. The same principle of agglutination to the root is followed in making new verbs from nouns or adjectives and in declining nouns and pronouns. There is no gender for noun, pronoun, or adjective. Adjectives are subjected to no change except for comparison. The Turkish syntax is peculiar. The unit of expression is the paragraph, and there is no punctuation. The subject of the ruling verb is placed as near as possible to the beginning of the paragraph. All subordinate sentences and clauses adding particulars have their verbs in participial form, the sense being thus suspended during the process of building the paragraph, until the chief verb coming in at the very end illuminates the whole.

The investigations of Thomsen and Radloff among the so-called 'Runic' inscriptions of the vicinity of Urga and the Orkhon River, south of Lake Baikal, have shown these inscriptions to be Turkish historical records, some of them dating back as far as the sixth century. One of the ancient Turkish alphabets has thus been recovered. But as the Turks became Mohammedans they began to adopt the Arabic alphabet, which is the only one now used by them, except as some of the northern tribes have adopted the Russian alphabet. They have increased the 28 Arabic letters to 33 by the device invented by the Persians of adding dots to five of the Arabic letters. Nevertheless the alphabet is quite unsuited to the Turkish, owing to its lack of proper vowels.

The onrush of the Turks from the Far East into all civilized lands, including China, which continued from the tenth century to the end of the seventeenth, enlarged the meagre Turkish vocabulary. The tribes which invaded India, now known under the name of Moguls, lost their language; but those which conquered Persia and overthrew the Byzantine Empire came under the literary influence of Persian at first, then of Arabic, and finally of Greek and the European languages. The consequence was that the Ottoman Turkish (Osmanli), as the Western branch of the language is called, adopted into its literary vocabulary Persian words for poetry and history, Arabic words for religious and legal writings, Greek words for the winds and currents and fishes of the sea, Italian words for all that relates to sailing vessels, and, later on, English terms for steam, the steamboat and its manœuvres, and French words for many of the terms of diplomacy.

The language of the Turkish tribes left in Central Asia and Persia and Southern Russia after the centre of the Turkish power had been transferred to Constantinople ceased its development at that point. That language is what is now known as Eastern Turkish. What it was at the end of the fifteenth century, that it is now. The dividing line between Eastern and Western Turkish is the Caucasus, the Caspian Sea, and the western frontier of the Persian Province of Azerbaijan. Beyond the Caspian Sea the difference of dialect is so great that a Turk from Bokhara, though able to make his simpler wants known in the streets of Constantinople, requires an interpreter for satisfactory conversation. The general characteristics of the Eastern Turkish, called *Jagatai* by the Turks of Constantinople, are a broader and harsher vocalization, a very confusing substitution of consonants, as *m* for *b*, *b* for *w*, *j* for *y*, etc., and a preservation of those ancient tense and case words which in the Western Turkish have become mere arbitrary particles added to the root to indicate tense or case forms. For this reason study of the Eastern Turkish in its purest form, as found, for instance, in Chinese Turkestan to-day, reveals the processes of evolution of the Turkish grammar. The grammar is practically the same in Turkestan as in Turkey, but in the East its forms have lost little by attrition. At the same time the unity of the two dialects is clear.

Eastern Turkish has many dialects. The language of some of the Kirghizes and that of the Yakuts of the river Lena is strongly tinged with Mongolian, and some Finnish affects the speech of the Tchuvashes of the Upper Volga. On the other hand, the Nogai tribes of the Caucasus and the Crimea use a dialect so nearly like the Ottoman Turkish that newspapers published in the Crimea have regular subscribers at Constantinople. The Kiptchak is the only one of these Eastern Turkish dialects which has literary life at present. It is the one, too, which most nearly approaches to the pure type of old Turkish found in the so-called Jagatai or Uighur of the East.

TURKISH LITERATURE.

Turkish literature is a term which at present implies the literature of the Western or Ottoman Turkish language. It may be regarded as falling into three periods: (1) The early period, when writers were from the region of Central Asia, and when the Persian was the model and often the instrument of their highest expression. (2) The middle period, beginning about the middle of the sixteenth century and extending well into the nineteenth, when Arabic dominated the Turkish literary world, having replaced Persian as model except in poetry. (3) The modern period, dating from about the time of the Crimean War (1853-56). In it the tendency of Turkish writers is to copy French, rather than either Persian or Arabian models, and to bring back into the language half-forgotten Turkish expressions.

The earliest literary remains of Turkish writers are the inscriptions mentioned above, deciphered by Thomsen, collected by Radloff, and their relation to the Chinese pointed out by Hirth. One of the earliest books of the early period, celebrated for its pure Turkish, is a genealogical history of the Tatars by Abul Ghazi of Khwarezm, dating from the twelfth century. The judge Burhaneddin of Sivas, a descendant of Genghis Khan, an adventurer, ruling over two provinces, who lost his life in trying to conquer another in 1398, has left some poems written in good Turkish, although after the Persian school. Another of the early poets was Suleiman Effendi (died 1410), chaplain to Sultan Bajazet, whom Tamerlane carried off. He wrote a poem in honor of the birth of the Prophet Mohammed which has been read throughout Turkey on public occasions in each year during nearly 500 years, and still retains its power to move its hearers. Another of the poets of the early period was Amudeddin, who wrote under the name Nesimi. Like the others of these early poets, he was under the influence of Sufiism (q.v.), and so incensed the more orthodox Mussulmans that he was flayed alive at Aleppo in 1417. Sheikhi, whose real name was Sinan (died 1420), was a doctor as well as a poet. His fame rests mainly upon his poem, the *Khar-namè*, or Donkey Book, in which he classifies his enemies according to the different types of asses found in the East.

Nevayi, whose real name was Ali Shir (died 1500), is the great representative of Turkish poetry in this period. He was Prime Minister for a time to Sultan Hussein of Herat, but retired early that he might write. He was a master in both Turkish and Persian. The thoroughly human quality of his writings appeared from the fact that one main source of our knowledge of the old Eastern Turkish language is a dictionary written by a Persian in order that Persians might profit by Nevayi's writings. The greatest prose writer of this period was Baber, great-grandson of Tamerlane, and 'Mogul' conqueror of India in 1525-26. His annals of his campaigns are written in plain Turkish, Arabic and Persian words being used to eke out his vocabulary.

Of the middle period of Turkish literature Saadeddin (died 1599) offers a type. He was a warrior of great renown, and afterwards Chief Justice of the Turkish Empire (Sheikh ul-Islam) under Sultan Mohammed III. The work on which his literary fame rests is a history of the Ottoman Empire, called *Taj-et-Tevarikh*. The style is of the most ornate Persian order and there is hardly any Turkish in the book except those auxiliaries essential to the binding of the sentences. Saadeddin followed the principle, which ruled literature throughout the middle period, that Arabic words must be brought into Turkish with all their grammatical rules and appurtenances. The effect is to make the finest Turkish literature of this period a mere mass of macaronics quite unintelligible to those who have not enough knowledge of Arabic and Persian to use dictionaries of those languages. Baki (died 1599), rated by Turkish critics as the 'king of the poets of Osmanli Turkish,' was a contemporary of Saadeddin. He was the son of a mosque servant who became one of the Caziaskers, or judges of the Supreme Court, under Sultan Selim II. His poetry was strongly Persian in flavor, but without slavish imitation. Another great poet of this time was Fuzuli (died 1563), whose real name was Mehmed, of Bagdad. To a foreign taste he offers more of originality than Baki. His poems are warm with the peculiar fire of Sufiism, and in both poetry and prose he loved the strong virile Turkish words. The list of Turkish poets is long, but those mentioned are still the greatest names. To them we may add at some distance Nedim (died 1725), who was buffoon to Sultan Achmet III. The name of Kiani, whose real name was Abu Bekr (died 1791), too, should have a place in the list of notable poets of this period. The simplicity and transparent beauty of his lines are such that had it not been for his inveterate waggishness he would hold very high rank among the Turkish poets. Another of the great poets of this period was Nabi (died 1712), whose *Ghazels* are accounted among the finest. His real name was Yusuf of Urfa. One of his longer poems, the *Khairiyè*, has been translated into French by Pavet de Courteille. We may also mention the poetess Sherif Hanum, who died in 1809, leaving a *Divan* of some merit.

The historians of the middle period make a long list. But their work is blemished, as a rule, by a difficult, stilted style, and the pettiness of the annalist. Among exceptions in the long series we may select Pechevi Ibrahim, who shows some inkling of what a historian should be; Solak Zadè, who died about 1680, and wrote in the graphic style of an eye-witness; and especially Katib Tshelebi, sometimes called Hajji Khalfah (q.v.). His real name was Mustafa, and he died in 1658, leaving an enormous mass of extremely valuable writings in history, geography, and bibliography.

To the same period probably belong certain writings of value which are passed over in scorn by the Turkish literary critics because they are not in the mongrel language of the pedants. Hence their authors are unknown. Of this class is the *History of the Forty Viziers*, dedicated to Sultan Mustapha I. (1617-23). It is a cycle of some seventy-five stories grouped about an incident of the Joseph and Potiphar order. The book is directed against the idea of trusting the fair sex and winds up, after all wrongs have been righted, with the quaint prayer, "May the Most High bring us all near to the good and to God, and keep us from the tricks of deceitful woman. Amen." Another of these unconsidered classics of Turkish is the *Life* of Nasr-eddin Hoja, a collection of bulls acted or spoken by a Turk of Asia Minor, who is delightfully humorous. To the same class belongs the story of *Shah Miran*, a collection of fairy-tales, religious in purpose, which is remarkable for its pure Turkish diction.

As a fruit of the Crimean War a revolution took place in the educational system of Turkey. The result has been the appearance of the modern school of writers who are yet to change entirely the character of Turkish literature. The heavy scholastic theologians are seeking to arrest the movement by the censorship, and they have persecuted or imprisoned some of the most powerful writers, like Ebuzzia Tewfik, or sent them to die in exile on a barren island like Kemel Bey. The aim of the new school of writers is to free the Turkish language from the incubus of Arabic grammatical purism. The writers who have perhaps done the most toward accomplishing this object are Ahmed Vefik Pasha (died 1893), whose dictionary of Turkish in two volumes was a revelation to multitudes, and Ahmed Mithad Effendi, noted for his novels, essays, and historical studies. Great as is the linguistic value of Ahmed Mithad's writings, they are too close imitations of French works to have permanent literary value. Of far greater weight was Kemal Bey, who died in 1878. Jevdet Pasha, illustrious as an historian, whose works show a steady development toward the simpler Turkish style; Zia Pasha, a brilliant essayist and poet; and Jevad Pasha, who has written a fine history of the origins of the Turkish military organization, are other examples of this school. Other notable names of this period are Muallim Naji, poet and essayist; Ebuzzia Tewfik, literary critic; Sezayi Bey, Hussein Rahmi, Ahmed Rasim, and Aliyè Hanum, daughter of the historian Jevdet Pasha, all of whom are novelists, dealing with current life in a realistic style entirely new in Turkish literature. The modern period cannot be said to have entirely revealed its qualities while strife with reactionist control continues. But it has at least shown that there is a future before the writers of Turkey, if they ever have freedom to speak and to develop.

Bibliography. For analysis of the philosophy of Turkish grammar, consult: Shaw, *Sketch of the Turkish Language as Spoken in Eastern Turkestan* (Calcutta, 1878-80): for the Eastern Turkish language, De Courteille, *Dictionnaire turc-oriental* (Paris, 1870); Vámbéry, *Cagataische Sprachstudien* (Leipzig, 1867); Radloff, *Die alttürkischen Inschriften der Mongolei* (Saint Petersburg, 1897); id., *Proben der Volkslitteratur der türkischen Stämme Süd-Siberiens* (ib., 1868); Böhtlingk, *Ueber die Sprache der Jakuten* (ib., 1851). For the Ottoman Turkish language, consult: Wells, *Practical Grammar of the Turkish Language* (London, 1880); Wahrmund, *Praktisches Handbuch der osmanisch-türkischen Sprache* (2d ed., Giessen, 1885); August Müller, "Türkische Grammatik," in the *Porta Linguarum Orientalium* (Berlin, 1889); Youssouf, *Grammaire complète de la langue ottomane* (Constantinople, 1892); Redhouse, *Lexicon of the Ottoman Turkish Language* (Constantinople, 1884), the most complete Turkish lexicon in existence; id., *English-Turkish Dictionary* (ib., 1861); Sami, *Dictionnaire turc-français, français-turc* (Constantinople, 1883), is a small but very useful work. For Turkish literature, consult: Jacob, *Türkische Litteraturgeschichte in Einzeldarstellungen* (Berlin, 1900 et seq.); id., *Türkische Volkslitteratur* (ib., 1901); Gibb, *History of Ottoman Poetry* (London, 1902): Hammer-Purgstall, *Geschichte der osmanischen Dicht-*

kunst (Pesth, 1836-38). "Turkish Literature," in the *World's Great Classics* (London, 1901), is a convenient collection of translations of typical Turkish works; except in the Ottoman poetry translated by Gibb, however, the articles are not taken directly from the Turkish, and often miss the point of the original. Poole, *The Story of Turkey* (New York, 1888), has some valuable remarks on the characteristics of Turkish literature.

TURKISH MUSIC. See Arabian Music.

TURK ISLANDS. A group of small islands in the Bahamas, connected politically with the Caicos Islands (q.v.).

TUR′KOMANS. A people whose principal home is in the great plains between the Caspian Sea on the west and the Sea of Aral and the Amu Darya on the east—the western part of Turkestan in the broader sense. Some of them are to be found in Persia, Afghanistan, and other regions. They belong by language, and largely by blood, to the Turkic stock. The Turkomans of Turkestan are under Russian rule. See Turkestan.

TURKO-TATARS, tĕr′kṓ-tä′tȧrz. A term used by certain ethnologists to designate a group of Ural-Altaic peoples composed of the Turkic and related so-called Tatar tribes and nations. Under Turko-Tatars are included: The Siberian peoples of Turkic stock, such as the Yakuts and Siberian Tatars; the Kirghiz-Cossacks of the Irtysh Caspian steppes; the Kara-Kirghizes of the Tian-Shan; the Uigurs, Sarts, Uzbegs, and Turkomans of Central Asia; the Tatars of the Volga; Bashkirs, Tchuvashes, and Meshtcheriaks, in European Russia; the Tatars of the Crimea and the Caucasus, including the Nogai, Karatchai, Kumyks, and Basians; the Azerbaijani; the Yuruks of Anatolia; the Osmanli Turks; and others. Many of these peoples, like the Osmanlis, Starts, Turkomans, Uzbegs, Azerbaijani, and the Turks of Turkestan, are largely Aryanized in blood, with often an added Semitic strain. Except the Yakuts, whose religion is Shamanism, and those Tchuvashes who have become Christian, the Turkic peoples profess Islam. The empires founded by Turko-Tataric peoples have had a rather ephemeral existence, and the realm of the Osmanli Turks in Europe owes its perpetuation not a little to the very mixed physical character of that people. Consult: Vámbéry, *Etymologisches Wörterbuch der turko-tatarischen Sprachen* (Leipzig, 1878); id., *Die primitive Kultur des turko-tatarischen Volkes* (ib., 1879); id., *Das Türkenvolk* (ib., 1885); Radloff, *Ethnologische übersicht der Türkstämme Siberiens und der Mongolei* (ib., 1883); Ujfalvy, *Expédition scientifique française en Russie, en Sibérie et en Turkestan* (Paris, 1878-80); Chantre, *Recherches anthropologiques dans le Caucase* (ib., 1885-87); id., *Recherches anthropologiques dans l'Asie occidentale* (Lyons, 1895).

TURK'S HEAD. A name given to a number of coffee-houses in London, among which that on the Strand, frequented by Dr. Johnson and Boswell, was the most noted. Others of the name were situated in Change Alley, in Soho, and in Westminster.

TURMAIR, to͞or′mir, Johannes. The real name of the German historian best known as Johannes Aventinus (q.v.).

TURMERIC (Fr. *terre-mérite*, Neo-Lat. *terra merita*, turmeric, apparently deserved earth, best earth, but probably a corruption of an Oriental name, perhaps of Ar. *kurkum*, from Skt. *kunkuma*, saffron), *Curcuma longa*. A plant of the natural order Scitamineæ or Zingiberaceæ, a native of the East Indies, much cultivated both in India and in Cochin-China, for its fleshy roots, more than $500,000 worth of which are annually exported from India alone. The lanceolate sheathing leaves and a short leafy spike of small cream-colored flowers spring from the crown of the root. Young roots abound in a kind of arrowroot, but older ones contain a large quantity of a resinous yellow substance called turmeric, which is used mainly for dyeing. The color is not very stable. Some of its other uses are in chemistry as a test for alkalies, their carbonates and phosphates, some of the alkaloids, and boracic acid, which change it to reddish brown, and as a condiment with many kinds of food, especially as a principal ingredient in curry-powder. The plant thrives best in a rich, friable soil, and a situation not liable to be flooded. It is propagated by cuttings of the root, which are planted at distances of eighteen inches or two feet, in April or May. The crop is gathered in December. This kind of turmeric is sometimes distinguished by the name long turmeric; and the name of round turmeric is given to *Kæmpferia pandurata*, a plant of the same order, also a native of the East Indies, the roots of which are shorter and rounder, but otherwise of very similar quality. They are especially valued for the preparation of an artificial gold varnish, as they yield a better color than the former kind. The Arabic name of turmeric is *kurkum*, whence *curcuma*. Turmeric is not cultivated commercially in the United States. See Curcuma.

TURMERIC (*Curcuma longa*).

TURN, to͞orn. A town adjoining Teplitz, in Bohemia, Austria. It has a magnificent park, bathing establishments, and thriving manufactures of many kinds, particularly porcelain. Population, in 1900, 12,408.

TURN′BULL, Laurence (1821-1900). An American physician, born in Sholts, Lanarkshire, Scotland. He graduated at the Philadelphia College of Pharmacy in 1842, and for a while was occupied in the manufacture of chemicals. In 1845 he graduated at the Jefferson Medical College, and was appointed house physician of the Philadelphia Hospital. He lectured on chemistry at the Franklin Institute from 1848 to 1850, and from 1857 to 1887 was attached to the Howard Hospital, in charge of eye and ear diseases, of which he became a well-known specialist. During the Civil War he served as a volunteer surgeon. Among his writings, some of which passed through many editions, are: *Defective and Impaired Vision* (1859); *Hints and Observations on Military Hygiene* (1862); *Imperfect Hearing and Hygiene of the Ear* (1871); *The Nature and Treatment of Nervous Deafness* (1874); *A Clinical Manual of the Diseases of the Ear* (1881); *A Manual of Anæsthetic Agents and Their Employment in the Treatment of Disease* (1885).

TURNBULL, Robert James (1775-1833). An American publicist, born in New Smyrna, Fla., where his father, an English physician, had established a Greek colony. He was educated in England, was admitted to the bar in Charleston in 1794, and practiced there until 1810, when he retired to his plantation. From the beginning he was active in the Nullification movement, and under the signature of 'Brutus' published thirty-one papers in the Charleston *Mercury*, during 1827, which were afterwards collected as the *Crisis*, and had much influence. In 1830 he published *The Tribunal of Dernier Ressort*. He was prominent in the Free Trade Convention at Charleston in 1831, and wrote the report. He was a delegate to the Nullification Convention in 1832, and prepared the address to the people. When the proclamation of President Jackson was read, he was the first to volunteer to resist the general Government.

TURNBULL, William (1800-1857). An American civil engineer. He was born in Philadelphia; graduated at West Point in 1819, and was commissioned in the artillery. He was engaged largely in topographical work, and was promoted to a captaincy in the topographical engineers in 1831, being brevetted colonel in 1847. In the Mexican War he was with General Scott as chief topographical engineer, and took part at Contreras, Cherubusco, and the capture of the City of Mexico. He was superintending topographical engineer on the Potomac Aqueduct for the water supply of Washington, D. C. Among his more important professional works were the building of the New Orleans Custom-House and the Cape Fear River improvements.

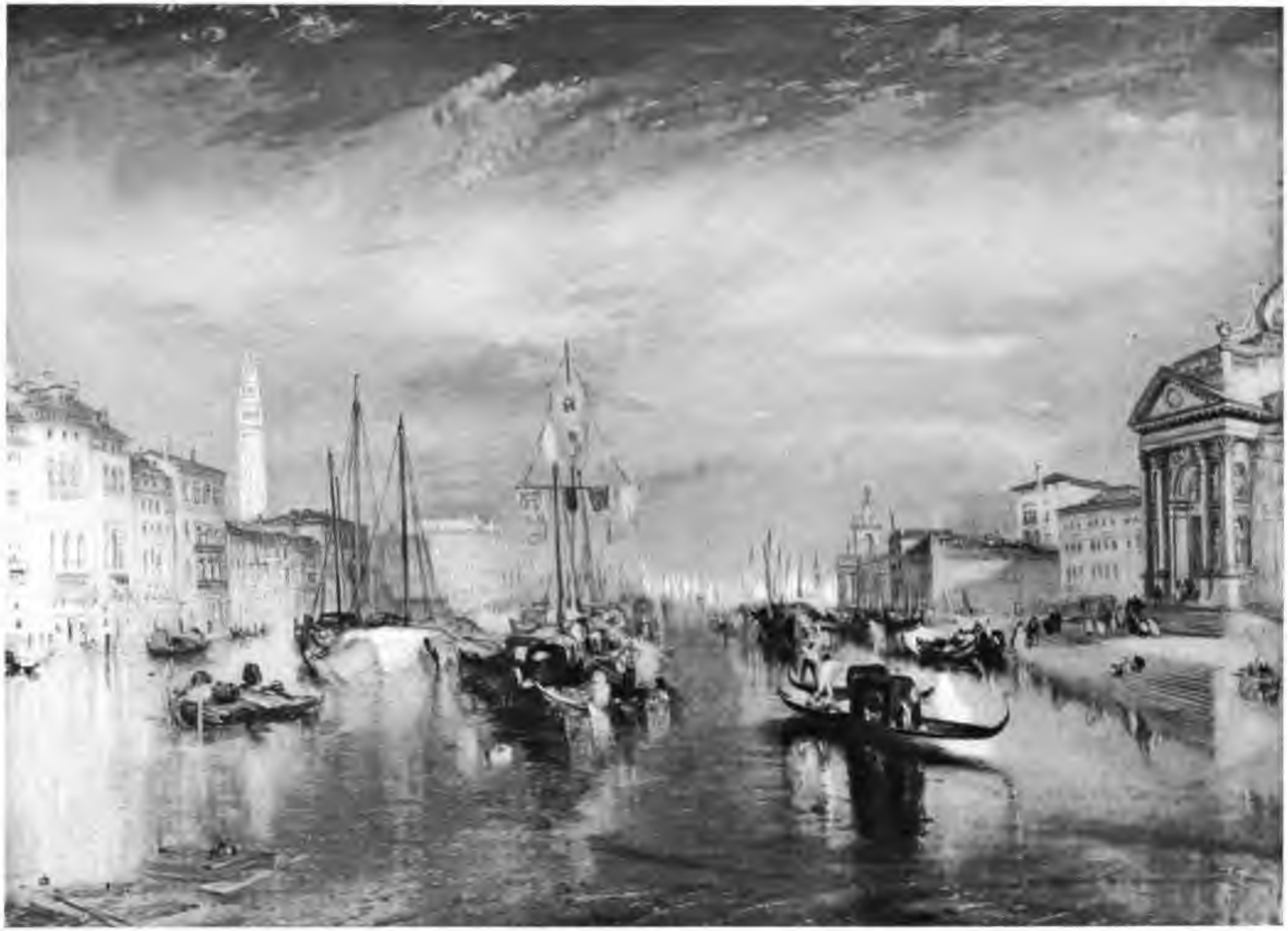
TURNBULL, William Barclay David Donald (1811-63). A Scottish antiquary, born at Edinburgh. He was educated for the law, and in 1832 was admitted as advocate at the Scottish bar, but he devoted the greater part of his time to the study of the antiquities and older literature of Great Britain. In 1834 he founded the Abbotsford Club, which did great service by printing works preserved only in manuscripts or old editions. In 1859 he was employed by the Record Commission, and in the course of the next two years published two valuable volumes of calendars of State papers, but on account of his Catholicism he was attacked by the ultra-Protestant party and compelled to resign. He was an industrious and careful editor, who without possessing systematic knowledge of language did excellent service by his editions of Middle English and early modern English poetry. Nor was his work as genealogist and historical editor of small value. Among his publications may be named: *Ancient Mysteries* (1835); *Arthour and Merlin* (1838); *The Romances of Sir Guy of Warwick and Rembrun His Son* (1840); *The Visions of Tundale* (1843); *Letters of Mary Queen of Scots* (1845); and *The Poetical Works of William Drummond of Hawthornden* (1856).

TURNBULL'S BLUE. See Hydro-ferricyanic Acid.

TURNE'BUS, Adrianus (Fr. Adrien Turnèbe) (1512-1565). An eminent French scholar, born at Andelys, famous as one of the leaders of the Renaissance in France. After completing his studies in Paris, he became professor in the University of Toulouse. In 1547 he was called to Paris, where he taught Greek and Latin, and later philosophy, until his death. From 1552 he had charge of all Greek books published by the royal press. Under him appeared the first editions of Philo and Synesius; he himself edited Æschylus, Aristotle's *Ethics*, Cicero's *De Legibus*, Horace and Varro's *De Lingua Latina*, and made many translations. Turnebus's influence extended far beyond the limits of France through his writings and pupils, of whom the most famous was J. J. Scaliger (q.v.). After his death his commentaries, translations, and other writings were published in three volumes (Paris, 1564-80). Consult the *Life* prefixed, and also Mattaire, *Historia Typographorum Aliquot Parisiensium* (London, 1817).

TUR'NER, Charles Tennyson (1808-79). An English poet, brother of Alfred Tennyson (q.v.). He was born at Somersby, in Lincolnshire. Like his more famous brother, he attended the Louth Grammar School, and then studied at home under the direction of his father, the vicar of Somersby. With Alfred, he published *Poems by Two Brothers* (1827; reissued 1893). In 1828 he entered Trinity College, graduating B.A. in 1832. In 1835 he was ordained curate of Tealby, in Lincolnshire, and two years later became vicar of Grasby, in the same county. On inheriting a small estate from a great-uncle, Samuel Turner, he added Turner to his name. His last years were passed at Cheltenham, where he died. After his juvenile verse, he published *Sonnets and Fugitive Pieces* (1830), which were appreciated by Coleridge; and similar volumes in 1864, 1868, and 1873. In 1880 Hallam Tennyson brought together all of his uncle's sonnets and lyrics under the title *Collected Sonnets, Old and New*.

TURNER, Charles Yardley (1850—). An American landscape and figure painter, born in Baltimore, Md. He studied in the National Academy and the Art Students' League of New York City, and afterwards was a pupil of Laurens, Munkácsy, and Bonnat in Paris. He first exhibited at the National Academy in 1882. His pictures include "Nooning" (1882), "The Wedding Procession" (Metropolitan Museum, New York City), and "The Courtship of Miles Standish" (1884).



J. M. W. TURNER

"THE GRAND CANAL, VENICE," FROM THE PAINTING IN THE METROPOLITAN MUSEUM OF ART, NEW YORK

TURNER, Frederick Jackson (1861—). An American historian, born at Portage, Wis. He graduated at the University of Wisconsin in 1884, and after pursuing graduate courses in Johns Hopkins University, returned to the former institution as instructor in American history. Subsequently he became in succession an assistant professor and a professor, and upon its organization in 1901 was made director of the School of History. He has been one of the editors of the *American Historical Magazine*, to which he has contributed largely. He published a number of historical articles in the *Reports* of the American Historical Association and in magazines, and also *The Indian Trade in Wisconsin* (1890), in "Johns Hopkins Studies."

TURNER, Joseph Mallord William (1775-1851). The most celebrated landscape painter of the English school. He was born in Covent Garden, London, April 23, 1775, the son of William Turner, a barber. Almost in his infancy he began to paint and draw. He had but little schooling beyond reading, which he learned from his father, and writing, which was all he acquired at the schools of Brentford and Hargate. During this time he was constantly employed in coloring prints and similar work. His father offered him every facility for artistic education in his power. Before 1789 the lad was placed with Thomas Walton, an architect, to learn perspective, but proved a sorry pupil. Afterwards he studied with Thomas Hardwick, on whose advice he entered the Academy Schools in 1789 to study landscape. He was admitted to the studio of Reynolds, under whom he copied portraits and perhaps learned oil technique; but Sir Joshua had but little influence upon the rising pupil.

His first drawing exhibited at the Academy was a view of Lambeth Palace (1790). During the following years he was much occupied with designs for prints in magazines, which necessitated sketching tours over a great part of England and Wales. He continued his artistic education, however, as one of the coterie of young artists who frequented the hospitable abode of Dr. Thomas Munro, whom Ruskin calls "Turner's real master;" this is only true in the sense that the artist profited by his patronage and more by his encouragement. In Munro's house he had opportunity to copy the early English watercolorists and also the older masters; there, too, he met Girtin and Cozens. He was especially influenced by Girtin, the founder of modern watercolor painting, with whom he sketched much and formed a fast friendship. The success of Girtin's Yorkshire aquarelles moved Turner, in 1797, to make a similar attempt, and his travels in Yorkshire and the north resulted in his forming several important friendships among the northern gentry, like that with Dr. Whitaker, whose works Turner afterwards illustrated with some of his best designs. More than this, it had a marked influence upon his artistic career, as is shown by his exhibit at the Academy in 1798, which proclaimed his genius as a painter of poetic landscape, in such pictures as "Morning on the Comston Fells, Cumberland" (National Gallery), and aquarelles like "Norham Castle," which Turner esteemed of high importance in his development. In 1799 he exhibited several Welsh subjects, in rivalry with Girtin, and his first picture of a naval engagement, the "Battle of the Nile"—works which secured his choice as associate of the Royal Academy.

With this year ceases what Ruskin calls Turner's period of development, and the period of his first style (1800-20) begins. Dropping the topographical subjects which had previously been his chief interest, he introduced historical and mythological motifs into his pictures, deliberately striving to equal or surpass the masters then most celebrated, William van de Velde, Nicolas and Gaspard Poussin, and Claude Lorraine, in their own subjects. He was especially influenced by Claude, the great painter of light, which Turner also considered the chief problem of painting. In 1802 he paid his first visit to the Continent, the results of which appeared in the exhibition in the following year of pictures and drawings of the Savoy Alps, most of which are now in the National Gallery, as well as "Calais Pier," and a "Holy Family" of the same year. The same collection possesses his famous "Shipwreck" (1805); his "Garden of the Hesperides" (1806), painted in the classical style in rivalry with Poussin: and the "Sun Rising Through Vapor" (1807), one of his best and most individual works. From 1807 to 1819 he was engaged in his *Liber Studiorum* (q.v.), in rivalry with Claude's *Liber Veritatis.* His work, however, went further than Claude's, in that it purposed to illustrate all classes of landscape, while Claude's was merely for purposes of identification of his pictures. The etchings for these plates, all of which were supervised or executed by Turner himself, show the master at his very best. During this period he also made travels in Devonshire, in the North of England, in Scotland, and on the Continent. Among other important works of this period are: "Apollo and Python" (1811); "Hannibal and His Army Crossing the Alps" (1812); "Crossing the Brook" (1815); and "Dido Building Carthage" (1815), the best of a Carthage series—all in the National Gallery.

With his visit to Italy in 1819 begins his second style (1820-35), the period of his most perfect works, distinguished by lightness and brilliancy of color. Ceasing to imitate the old masters, he nevertheless clung to the classicist idea of ideal composition. This mature style is well represented by the first of the series of the wonderful Italian pictures upon which his fame chiefly rests—the "Bay of Baiæ, with Apollo and the Sibyl" (1823); also by "Dido Directing the Equipment of the Fleet" (1828); "Ulysses Deriding Polyphemus" (1829); "Caligula's Palace and Bridge" (1831); and "Childe Harold's Pilgrimage" (1832). During 1833-46 he often visited Venice, which for some time exercised a paramount influence upon his art. Of his numerous Venetian subjects the National Gallery possesses a rich collection of watercolors, and the "Grand Canal," in the Metropolitan Museum, New York City, is a fine example of the oils. He found time, however, for other subjects, like "Saint Michael's Mount, Cornwall" (1834), and "The Fighting *Téméraire*" (1838), the best known and most popular of his works. His time was still much occupied with designs for illustrations, like *Rivers of England* and *Ports of England,* in 1824. The drawings for the series *England and Wales*

(1827-38), in which several line engravers under Turner's supervision brought this art to a new perfection, are wonderful in color and atmospheric effect. In 1830 appeared the lovely illustrations to Rogers's *Italy;* in 1833 the first of his *Rivers of France*, the drawings for which are among the most perfect of his works. He also illustrated the works of Byron, Scott, Milton, Campbell, Rogers's *Poems*, and Moore's *Epicurean*.

The third period of Turner's art (1835-45) is characterized by the relinquishment of classic composition and a more direct communion with nature, of which he endeavored to render his splendid impressions, foreshadowing the modern Impressionists. Though it tended to become more dreamlike and unreal in character, his work was more wonderful in color than ever. To this period belong many of his greatest works, such as the "Slave Ship" (1840, Boston Museum); "Snow Storm" (1842); "Approach to Venice" (1843); "Rain, Steam, and Speed" (1844)—all in the National Gallery. Here belongs also a series of attempts to represent vague thoughts in color language, like "War—The Exile" (ib., 1842), and many of his pictures of Alpine scenery, the grandeur of which he has rendered as no other painter, in such paintings as "The Splügen." After 1845 his mind and sight began to fail; but though his work was incoherent, it was still good in color. He began a new series, "The Whalers," which he did not live to complete. He died at Chelsea, December 19, 1851, and was buried in Saint Paul's Cathedral. He left a fortune of £140,000, and a splendid collection of his own works, 262 oils, 135 water colors, 1757 studies in color, and almost innumerable sketches. In later life he refused most tempting offers to sell his best works, although the buyers intended to bestow them upon the nation, because he wished to do this himself. Most of these works are in the National Gallery. He intended that his fortune should be devoted to the establishment of pensions for indigent English artists, but his will was broken and most of it fell into the hands of the lawyers and relatives. Though very economical, even sordid in his personal habits, he was generous to others. There has been much useless prattle about his private life and character. Those who knew him best found him infinitely tender, a kind and dutiful son, and a faithful friend. His brusque manner was but a foil of his retiring disposition, which made him inaccessible to society. It is difficult to reconcile these characteristics and the exquisite refinement of Turner's art with the supposed coarse character of his relation to women.

Turner's life was one continuous course of prosperity, and he fully achieved the fame he so ardently desired; in 1802 he was elected Academician, and in 1808 became professor of perspective at the Academy. He easily eclipsed in the public favor all landscapists of his day. In later life his works were attacked, but to atone for this he found in John Ruskin the most eloquent advocate ever possessed by any artist, though these eulogies have created several wrong ideas about Turner's art. The chief characteristic of Turner does not consist, as Ruskin maintains, in his fidelity to Nature. He was indeed one of the profoundest students of Nature that ever lived; but he sought to render her more ideal, beautiful, and sublime than reality, much as was done by Byron and Shelley in literature. His master passions in art were the rendition of light, in which he surpassed even Claude, and that subtle quality which Ruskin calls the "Turnerian mystery," by which objects are rendered with a certain hazy indistinctness of the highest poetical effect. His chief technical quality is not naturalism, but a splendid and brilliant, though sometimes unreal, color. He was as subtle and refined in drawing as in composition. Others have painted more intimate phases of landscape than he, but in range of subject, imagination, and sublimity Turner has never been equaled. Though unsound in oil technique, as is evinced by the ruined state of many of his best works, he was a consummate master of water-color (q.v.), which in his hands became a new art. He was himself an excellent etcher and engraver, trusting to mezzotint to produce the light and shadows; and his designs for illustrations produced a new school of line engraving in England. His facility of execution and diligence were well-nigh incredible, as may be seen from the large number of works in the public and private collections of England. A number of collections in the United States, including the Metropolitan Museum, Lenox Library, and Vanderbilt collection in New York City, possess good examples of his work, both in oil and water-color.

Bibliography. The most brilliant and sympathetic appreciation of Turner is Ruskin's *Modern Painters* (London, 1843-60), the chief purpose of which is to show his superiority to all painters who preceded. Its value is, however, rather literary than critical, and it should be compared with the more sober judgment of works like Hamerton's *Life of Turner* (ib., 1879). Of the other lives, Thornbury's (ib., 1862) is uncritical, though containing valuable material; far better is that of Cosmo Monkhouse (ib., 1882), who also wrote the good article in the *Dictionary of National Biography*. Consult also the monographs by Burnet (London, 1859) and Dafforne (ib., 1877).

TURNER, Nat (c.1800-31). An American negro slave and insurrectionist, who was born and lived in Southampton County, Va. From his childhood he fancied himself set apart from his fellows for some great purpose, and claimed to hear voices and see visions. In 1828 he declared he had a command to rise and slay his enemies, when a sign should be given. The eclipse of the sun in February, 1831, was accepted as the sign, but nothing was done until after a peculiar solar appearance on August 13th. With four or five companions, he began near Cross Keys, on Sunday night, August 21st, by killing five members of his master's family in their beds. The conspirators proceeded, being joined by recruits until the number reached 53, killing all, even infants, in every house in the neighborhood. On the next morning they killed all the pupils at a school. By noon the news had spread and the band was routed by a party of white men. The excitement was intense. United States troops from Fortress Monroe and the militia from various counties of Virginia and North Carolina gathered and the conspirators were hunted like wild beasts. Turner kept himself concealed for six weeks. When his hiding-place was discovered he fled, but was captured near Cross Keys October 30th, was tried and convicted at Jerusalem, and on November 11th was there hanged. In all only 17 negroes were executed, as it was proved that some in the party were there under compulsion. Fifty-seven whites were slaughtered and more would have been killed but for the faithfulness of slaves, who in several instances defended their masters. The results of the massacre were immediate. More stringent slave codes were passed in many States, free negroes were deprived of their privileges, and the Manumission movement, which had considerable strength previously, was effectually checked. Consult: Weeks, "The Slave Insurrection in Virginia," in *Magazine of American History* (New York, June, 1891); Drewry, *The Southampton Insurrection* (Washington, 1900).

TURNER, Samuel Hulbeart (1790-1861). A Protestant Episcopal theologian. He was born in Philadelphia, and graduated at the University of Pennsylvania in 1807. He was rector of churches in Chestertown, Md., New York, and Brooklyn, and became in 1818 professor of historic theology in the New York General Theological Seminary, and in 1821 professor of biblical learning and Scripture interpretation. He was also professor of Hebrew in Columbia College after 1830. Among his works are commentaries on Romans (1824 to 1853), Hebrews (1852), Ephesians (1856), and Galatians (1856); *Bibliographical Notices to the Most Distinguished Jewish Rabbis* (1847); *Companion to the Book of Genesis* (1841); *Parallel References of the New Testament* (1848); *Thoughts on Scriptural Prophecy* (1852). Consult his autobiography (New York, 1863).

TURNER, Sharon (1768-1847). An English historian. He was born at Pentonville, and at the age of fifteen was articled to an attorney, to whose practice he succeeded six years afterwards. He was a successful practitioner until 1829, when he retired. From an early time his entire leisure had been devoted to a study of the Anglo-Saxon period of English history from the hitherto almost unused Anglo-Saxon manuscripts in the British Museum. These studies culminated in his famous *History of the Anglo-Saxons* (London, 1797-1805; 7th ed. 1852). He continued his narrative in subsequent years under various titles to the end of Elizabeth's reign, but with less happy results. These historical works were finally published in a collective edition under the title *History of England from the Earliest Period to the Death of Elizabeth* (London, 1839). He also wrote *Sacred History of the World as Displayed in Creation and Subsequent Events to the Deluge* (ib., 1832; 8th ed. 1848), and other works.

TURNER, Sir William (1832—). An English anatomist and naturalist, born in Lancaster and educated at Saint Bartholomew's Hospital. In 1854 he became a demonstrator of anatomy, and in 1867 professor of anatomy in the University of Edinburgh. Besides these offices, he held various other teaching positions, and for many years represented the University of Edinburgh in the General Council of Medical Education. From 1866 to 1894 he was one of the editors of the *Journal of Anatomy and Physiology*. In 1886 he was made a knight. Among his longer works are *An Introduction to Human Anatomy* (1875); *Lectures on the Comparative Anatomy of the Placenta* (1876); and an *Atlas of Human Anatomy and Physiology*.

TURNER, William Wadden (1810-59). An American philologist, born in London. In 1818 he emigrated to New York, and became a printer's apprentice. He was librarian of the University of New York, instructor in Hebrew in the Union Theological Seminary, and from 1852 librarian of the United States Patent Office. Besides contributions to learned societies and periodicals, he published with Isaac Nordheimer *A Critical Grammar of the Hebrew Language* (1851), and *Grammar and Dictionary of the Yoruba Language* (1858); and translated the greater part of Freund's *Latin-German Lexicon*.

TURNER'S FALLS. A village in the town of Montague (q.v.), Mass.

TURNHOUT, tụr-nout′. A town in the Province of Antwerp, Belgium, 25 miles east by north of the city of Antwerp (Map: Belgium, C 3). It has an old castle, now utilized as a court of justice and a prison, and the Church of Ouel-Turnhout with noteworthy paintings. Turnhout manufactures lace, cloth, leather, and playing cards. Leech-breeding is also an important industry. The town was the scene of a victory of the Dutch, under Maurice of Nassau, over the Spaniards in 1597, and in 1789 the Austrians were defeated here by the Belgians under Van der Mersch. Population, in 1900, 20,945.

TURNING. See Metal-Working Machinery; Wood-Working Machinery.

TURNIP (from *turn* + *nep*, from AS. *næp*, turnip, from Lat. *napus*, sort of turnip), *Brassica campestris* (*rapa* of some botanists). A biennial plant of the natural order Cruciferæ, cultivated in cool climates for its globose, oblong or roundish, swollen and fleshy roots, which are used as a vegetable and for stock-feeding. It is a native of temperate Europe and Asia, growing in fields and waste places. The cultivated varieties are very numerous. Some attain a weight of 20 or 25 pounds. Garden turnips are sown in early spring or even as late as midsummer; field turnips generally in midsummer, so as to avoid the possibility of developing a flower stem in the year they are planted, a development which impairs the quality and impedes the development of the edible part. The varieties both of garden and field turnips are very numerous. The garden turnips are generally of comparatively small size, rapid in growth, and of delicate flavor. The name Swedish turnip or rutabaga is given to a group of varieties cultivated in the same manner and used for the same purpose as the common field and garden turnip.

The cultivated turnip grows best in a rich soil. It is not well suited to clay soils, although it is often grown on them. A complete pulverization of the soil is requisite before the sowing of the seed. On light soils, a crop of turnips generally succeeds wheat or oats. The seed may be sown either in drills 2-2½ feet apart or broadcast. The young plants are thinned out by hand to 8 inches or more apart, and the ground is stirred and carefully kept clean by cultivation and hoeing. The turnip crop is thus of great use in clearing the land of weeds. In many places part of the crop is eaten on the ground by sheep, which are corralled upon small areas in the field, each third row being left for this purpose, the plants in the other two rows being fed or stored in houses or earth-covered pits or by being covered in the field with earth plowed over them. Swedish turnips are the most hardy varieties.

COMMON TURNIP (*Brassica campestris* or *rapa*).

Both the ordinary turnip and the rutabaga are used for feeding stock, the former less than the latter. Both are classed as coarse fodder, since they are bulky in proportion to their nutritive value. Turnips have the following average percentage composition: Water, 90.5; protein, 1.1; fat, 0.2; nitrogen-free extract, 6.3; crude fibre, 1.1; and ash, 0.8. Swedish turnip: Water, 88.6; protein, 1.2; fat, 0.2; nitrogen-free extract, 7.7; crude fibre, 1.3; and ash, 1.1. Experiments show that 90 per cent. of the total dry matter, nitrogen-free extract, and crude fibre of turnips is digested. In Great Britain, Northern Europe, and Canada large quantities of turnips are fed, with other roots, replacing grain to a considerable extent. Roots are little fed in the United States, probably because they are less easily cultivated than corn. Turnips are used especially for sheep. Dairy cattle should be milked before being fed turnips, even in limited quantities, to avoid the possibility of tainting the milk. Sheep prefer the Swedish turnip to all other roots. Slicing and pulping are commonly practiced. See Plate of CABBAGE AND ALLIES.

TURNIP INSECTS. There are practically no insects specifically attached to the turnip, although this crop frequently suffers from the attacks of several kinds of insects. The foliage is eaten by very many of the insects which are found upon cabbage (see CABBAGE INSECTS), and the cabbage root-maggot sometimes affects the turnip tuber. Several of the root-feeding beet insects also attack turnips. See SUGAR-BEET INSECTS.

TURN-SEVERIN, or **TURNU- SEVERIŃ**, tụrn'sȧ'vȧ-rēn'. A town of Rumania on the Danube just below the Iron Gate, about 175 miles west of Bucharest (Map: Balkan Peninsula, D 2). Near it are the remains of Trajan's Bridge, erected A.D. 103. Population, in 1900, 18;626.

TURNSPIT. A dog. See HOUND.

TURNSTONE. A shore-bird (*Arenaria interpres*), related to the plovers and surf-bird (q.v.), and found in almost every part of the globe. It breeds in the Arctic regions, but occurs on the coasts of the Eastern United States during migrations. It frequents the seashore, and derives its English name from its habit of turning over small stones with its bill in search of food. The eggs, which are four in number, are laid on lonely rocky coasts where there is sparse vegetation. They vary very much in color and markings, and are cunningly concealed. The length of the turnstone is rather more than 9 inches. The plumage varies with the age of the bird and the season, but is always pied black and white, with rufous or brownish ash. (See Colored Plate of SHORE-BIRDS.) On the coasts of the North Pacific is found a turnstone (*Arenaria melanocephala*) which lacks the rufous or brownish ash. These two are the only known species.

TURPENTINE (OF. *turbentine*, *terebentine*, ML. *terebintina*, turpentine, from Lat. *terebinthinus*, relating to the terebinth, from *terebinthus*, from Gk. τερήβινθος, terebinth). The resinous exudations of various species of coniferous trees. When the viscid exudation is distilled, oil or spirit of turpentine passes over, leaving behind a residue of common colophony. The distillation is carried out in copper stills. The mass is gradually heated to 316° F. (158° C.), which is approximately the boiling temperature of oil of turpentine. The resin remaining in the still is drawn off while hot. French turpentine is distilled by means of a current of steam. The oil or spirit of turpentine dissolves camphor, resins, and other organic substances and mixes freely with alcohol, ether, and glacial acetic acid. It does not mix with water. It is a thin colorless liquid readily recognized by its characteristic odor. Chemically it is a mixture of several isomeric hydrocarbons (terpenes) represented by the formula $C_{10}H_{16}$ and converted by oxidation into a camphor having the composition $C_{10}H_{16}O$. Oil of turpentine is largely used in medicine as an irritant and counter-irritant in chronic inflammations. It is an excellent remedy for ringworm, and is given internally also to stop hemorrhages, and as a remedy for gonorrhœa. The administration of turpentine is attended with some danger, as it is likely to produce inflammation of the kidneys. In the arts oil of turpentine is used for the preparation of varnishes and for similar purposes. American turpentine is derived from the Pinus australis and the Pinus tæda; French turpentine from the Pinus maritima; Russian and Swedish turpentine from the Pinus sylvestris and the Pinus Lederbourii. Canada turpentine, or Canada balsam, is obtained from the Abies balsamea, growing in Canada and the Northern United States.

TURPENTINE TREE. See Pistacia.

TUR'PIN or **TULPINUS** (?-c.800). A supposed mediæval chronicler, Archbishop of Reims. He is described as a friend and companion of Charles the Great and an eye-witness of the exploits he relates in a chronicle in Latin prose narrating the expedition of the Frankish Emperor against the Saracens of Spain, and particularly the events that preceded and followed the battle of Roncesvalles (q.v.). Turpin's name became attached to this chronicle, but though there was an Archbishop Turpin of Reims (c.754-c.800), he has no claim to the description given above, and internal evidence leads to the conclusion that the chronicle is a work of the twelfth century. It seems to have sprung out of the epic ballads and traditions of the Carolingian heroes, and was taken from a manuscript composed probably at Compostella. The poems were changed considerably in order to further pilgrimages to Compostella. The book soon acquired a great popularity, was translated into French by 1206, and was made use of by divers chroniclers, as the author or authors of the *Chroniques de Saint-Denis*, Vincent of Beauvais, and others. The chronicle is of great historic value, in spite of all the embellishments it has from time to time received. There have been several editions of the chronicle in Latin; the best, by Casteta, was published at Paris and Montpellier in 1880. It has been translated into many languages, among others into English by Rodd (London, 1812), reprinted in *Mediæval Tales*, in *Morley's Universal Library* (London, 1890). For editions and secondary works, consult Potthast, *Bibliotheca Historica Medii Ævi*, vol. ii. (Berlin, 1896).

TURPIN, Edmund Hart (1835—). An English concert organist, lecturer, and composer. He was born in Nottingham and after studying under local teachers went to London, where he became a pupil of Hullah and Pauer. In 1857 he removed to London and made that city his home. Twelve years later he became organist of Saint George's, Bloomsbury, and removed to Saint Bride's, Fleet Street, in a like capacity in 1888. He was the editor of the *Musical Standard* for several years and enjoyed a wide fame as a musical writer and lecturer. In 1875 he became secretary of the College of Organists and did much to build up the college. In 1891 he became joint editor of the *Musical News*. His works include a mass, a cappella and a mass for soli, chorus, brass drums, and organ; the oratorios *Saint John the Baptist and Hezekiah;* the cantatas *A Song of Faith* and *Jerusalem;* and a symphony, *The Monastery*. Other works are numerous services, string quartets, chamber music, pianoforte pieces, and organ concert music.

TURPIN, Richard, commonly called 'Dick Turpin' (1706-39). An English highwayman. He was born at Hempstead, Essex, where his father was an innkeeper. He was apprenticed to a butcher, and, detected in cattle-stealing, he fled and joined a gang of thieves. They committed several brutal robberies, but disbanded after two of their members were captured and hanged. Turpin then became associated with the highwayman Tom King, whom he fatally shot when trying to prevent King's arrest. Turpin escaped into Yorkshire, where he passed for a gentleman, but was soon suspected, and finally captured with some stolen horses, tried, and executed. Turpin's reputation as a hero, and a man of courage and generosity, together with his marvelous ride from London to York, are fabrications which were enhanced by Ainsworth's vivid and descriptive characterization in the novel *Rookwood* (1834).

TURQUOISE (OF. *turquoise, turques*, Fr. *turquoise*, fem. of *turquois*, Turkish, from *Turc*, Turk). A hydrated aluminum and copper phosphate that is found massive. It is opaque, has a waxy lustre, and occurs in various shades of blue to green. The peculiar bluish-green or robin's-egg tint is the preferred color for the gem varieties. Turquoise is found in narrow seams and irregular patches in igneous and volcanic rocks. The best specimens come from the vicinity of Nishapur, Persia, but the mineral is found also at various localities in Asia Minor, Turkestan, and Siberia. In the United States, the locality in the Los Cerillos Mountains, near Santa Fe, New Mexico, was worked by the ancient Mexicans, and still yields fine gems. Other localities in the United States are in Colorado, Arizona, Nevada, and California. Among the early Mexicans turquoise was regarded as emblematic of success, and was worn to preserve health. The peculiar property of the turquoise, of becoming dirty-green in color as it gives up its moisture, led to a belief that its change in color foretold misfortune, and hence the Oriental proverb that the turquoise pales when the well-being of the giver is in danger. It was believed in the Orient to be a remedy for all diseases of the head and heart, and in cases of poisoning or snake-bite it was given with wine. *Bone turquoise* or *odontolite* is fossil bone colored blue by iron phosphate.

TURRET (OF. *tourette, touret*, little tower, diminutive of *tur, tour*, Fr. *tour*, tower, from Lat. *turris*, Gk. *τύρσις*, *tyrsis*, *τύρρις*. *tyrris*, tower; connected with Lith. *tursa*, bag). This name is now applied to revolving towers of circular or oval section in which naval guns are mounted. Fixed towers are commonly called barbette towers or barbettes, as all gun towers of this class on modern ships are designed to have the guns fire over the tops of their walls.

TURRETIN, tụr'tăɴ', or **TURRETINI,** tōō'râ-tē'nâ, François (1623-87). A Swiss Calvinistic theologian. He was born in Geneva; studied theology first in his native city and afterwards in Holland and France; was pastor at Geneva, 1647; removed to Leyden, 1650; and was recalled to Geneva as professor of theology, 1653. His principal work, *Institutio Theologiæ Elencticæ* (1679-85, new ed., Leyden, 1696, reprinted Edinburgh, 1847-48), ranks high among the strictest expositions of Calvinistic theology. He was one of the authors of the Helvetic Consensus (1675) directed against the milder theology of Saumur. His complete works were published at Geneva in 1688. His son, Jean Alphonse (1671-1737), was born at Geneva, and was professor there of ecclesiastical history, 1697. He followed the Saumur theology as taught by Tronchin, his teacher, and endeavored to unite the Reformed and Lutheran churches. His chief work is *Cogitationes et Dissertationes Theologicæ*

(1711-37). Consult the lives of the elder and the younger Turretin, as they are commonly called, by E. de Bude (Lausanne, 1880).

TURTLE (probably a corruption either of *tortoise*, or of Sp. *tortuga*, Port., It. *tartaruga*, OF. *tortuge*, *tortue*, Fr. *tortue*, tortoise; in either case ultimately from Lat. *tortus*, twisted, so called on account of the crooked feet; probably influenced by popular etymology with Eng. *turtle*, sort of dove). A shell-incased reptile of the order Chelonia. The word 'turtle' is used mainly to indicate the large marine forms, although in the United States it is applied freely to both fresh-water and land forms. 'Tortoise' (q.v.), strictly speaking, refers to land forms.

STRUCTURE. The body of a turtle is invariably short and broad, and is protected both above and below by more or less bony shields, with spaces between them in front and behind, into which the head and legs may be drawn. The conical tail is usually simply bent around against the side of the body when the turtle retracts into the shell, and thus covers the circular vent. The armature or 'shell' is composed of an upper part, the 'carapace,' and a lower, the 'plastron.' The carapace is formed from the ribs, of which there are eight pairs; and from the annular parts of the dorsal vertebræ, expanded into plates, which are joined to each other by dentilated sutures, so that the whole acquires great firmness, and the dorsal vertebræ are rendered immovable. The plastron is formed of pieces which represent the sternum or breast-bone, and which are ordinarily nine in number, and have names, as also have the parts of the carapace. The box-tortoise has certain plates movable, so as more completely to inclose its body. The turtles and other aquatic chelonians cannot thus withdraw their head, tail, and limbs from danger, but the greater activity of their movements compensates for this. The above remarks apply to all turtles (Thecophora) except the leatherbacks (Athecæ), whose body is jacketed in a continuous leather-like case composed largely of a mosaic of polygonal bony plates; and the vertebræ and ribs are not fused with, but are free from the carapace. See LEATHERBACK.

Externally the entire shell is covered with horny epidermal plates or shields of various forms and ornamentations, but arranged in all families on a regular plan. Each shield grows individually, the rings visible upon many of them indicating each a year's growth—at least in countries where a winter hibernation and consequent suspension of growth takes place. These plates may be detached by heat, and in the hawksbill are of the beautiful material called 'tortoise-shell' (q.v.). The neck, legs, and tail are often provided with a horny scaled armature. A cuticular layer covers the outside of the armature and is shed in fragments from time to time. The skull agrees fundamentally with that of crocodiles, but has several peculiar features, and is very solid. The mouth is bounded by a more or less horny beak like that of birds. The jaw is toothless, and the food is swallowed whole. There is, therefore, no need of a delicate sense of taste, and this sense is degenerate. In the stomach there are no organs of trituration, and the process of digestion is necessarily very slow, and is dependent on the action of the gastric juice. The heart is short, thick, and has but one ventricle. The lungs are large and are capable of containing much air. The air is drawn into the mouth, the passages to the nares are then stopped by the tongue, and the air is gulped down. This way of getting air into the lungs is required by the rigidity of the armature, which prevents expansion and contraction of the chest. Turtles can remain under water for an hour or so without renewing the lung contents. The eyesight of turtles is very keen. The eye is protected by an upper and a lower lid and in addition by a nictitating membrane, as in birds. The sense of hearing is very acute.

HABITS AND HABITAT. When startled, some turtles, such as the wood-turtle, give a loud snake-like hiss. The males of the large Galapagos tortoises, according to Darwin, bellow or roar at the breeding season. Our common painted turtles utter a piping note, particularly in the spring. Turtles are diurnal except at the breeding season. With the exception of sea-turtles, the habitat of any individual turtle is very local. Certain tortoises and terrapins that have been marked have been observed in the same pasture year after year. Sea turtles return to the same locality to breed. Those in the temperate region hibernate throughout cold weather buried in earth or mud. Marine forms have the legs modified into huge paddles, while amphibious forms have leg-like limbs only partially webbed. The coloration of those that spend considerable time on land simulates very much that of the ground. One form (see MATAMATA) has a fringed or foliaceous neck of much service in hiding it while seeking prey or avoiding foes.

About 250 species of Chelonia are known, the most numerous species being found in fresh water, generally in warm climates. The marine species are the largest. Several kinds occur in the Alleghany region at considerable altitudes, but none live in the Rocky Mountains. Chelonia are not numerous in kinds on the California coast, or in Europe, while on the Asiatic coast they are abundant.

FOOD. Some of the sea-turtles, the land-tortoises (q.v.), and a part of the fresh-water terrapins (q.v.) are herbivorous, and these are the ones commonly eaten by man. Other sea and fresh-water forms feed entirely or in part on animal food, and are usually ferocious. Fresh-water forms, such as the snapping turtles (q.v.), feed on fish, mussels, earthworms, insect larvæ, young ducks, and the like. The box-turtle eats mushrooms and berries, and not infrequently makes raids on tomato gardens. Certain pond forms are practically omnivorous.

EGG-LAYING. Aquatic turtles come on land usually on moonlight nights at the breeding time to deposit their eggs. A sandy slope is preferred by most forms. In this soil they dig a hole with the hind feet, let the eggs fall within it, and replace the sand so deftly that the ground seems scarcely disturbed. The female then retreats quickly to the water. Almost any soil will suffice for the American painted turtle, and the same rotten log may be utilized by many musk-turtles until it holds hundreds of eggs. The eggs, if not dug up by some animal, are left to hatch in the warm sand by the aid of the sun's heat alone. The snapping turtle deposits from 18 to 30 eggs in the early morning hours. The wood, painted, and skunk turtles, which lay from three to eight eggs, choose the afternoon for egg-laying. The eggs of snapping turtles are usually spherical and about the size of a walnut. The shell is tough and leathery. Certain other turtles lay oval eggs, and a few eggs having a shell of a fine porcelain texture. The eggs hatch slowly, some kinds only after three or more months. As soon as the young, water-loving turtles hatch they begin to creep about and to travel down inclines until they eventually reach water.

All the species are extremely tenacious of life; they are capable of extraordinary abstinence, and of living long after having sustained injuries which would have been immediately destructive to almost any other animal. They are also remarkable for their longevity, examples of which are mentioned under TORTOISE.

ECONOMIC VALUE. The flesh of those which subsist on animal food is musky and unpleasant; but that of vegetable feeders is much esteemed. The eggs of most species are excellent. Vast quantities of eggs of the large Amazonian 'arrau' (*Podocnemis expansa*) are also pressed to obtain oil of large commercial value. The most highly esteemed for food is the green turtle (q.v.), and its relative the 'edible' turtle of the East Indies. Many smaller kinds are eaten, including the favorite American terrapin (q.v.), the snapping turtle (q.v.), and other fresh-water forms.

CLASSIFICATION. The Chelonia were at first divided according to modifications of the feet. Cope, recognizing the separability of Trionychoidea, also, in 1870, emphasized a division based upon the mode of carrying the neck, one group (Pleurodira) bending it sidewise in withdrawing the head, and the other (Cryptodira) withdrawing it in an S-shaped curve in a vertical plane. A more worthy division is Athecæ for the shell-less Spargidæ, or leatherbacks, and Thecophora for all other kinds. Boulenger's classification is as follows:

CHELONIA	Athecæ		Sphargidæ.
	Thecophora	Pleurodira	Pelomedusidæ. Chelydidæ. Carettochelydidæ.
		Cryptodira	Chelydridæ. Dermatemydidæ. Cinosternidæ. Platysternidæ. Testudinidæ. Chelonidæ.
		Trionychoidea	Trionychidæ.

The Pelomedusidæ are a small family of African and South American turtles including the large and valuable 'arrau.' The family Chelydidæ includes the curious matamata (q.v.), certain long-necked Australian types (Chelodina), and the South American Hydromedusa. The Carettochelydidæ are a family in which is set a strange small turtle of New Guinea, whose 'shell' is covered with soft skin instead of horny shields. Of the cryptodirous families, the Chelydridæ are represented by the various snapping or 'alligator' turtles (q.v.), and the Dermatemydidæ by a few species of aquatic tortoises of Central America. The Cinosternidæ are the family of the North American 'skunk' or 'stinkpot' turtles. (See MUSK TORTOISE.) Platysternidæ includes only a single Siamese water-tortoise. The Testudinidæ, on the other hand, are the most populous of Chelonian families and nearly cosmopolitan. The shell in this family is always covered with well-developed horny shields, the plastron has nine bones, and the neck is completely retractile. About twenty genera with more than 110 species are now recognized; but the generic distinctions are not easily recognized by external appearances. Here are classified the North American 'mud-turtles' of the genus Chrysemys, which abound in all still waters, as do the 'pond-tortoises' (Emys) of Europe, the terrapins (q.v), and the box-tortoises (Cistudo). The last get their name from the fact that the plastron, which is united with the carapace by ligaments, is divided into two movable lobes, connected by a hinge permitting them to be lifted up against the overhanging carapace, and closing both ends of the shell perfectly after the animal has drawn within its defenses. The common box-tortoise of the United States (*Cistudo Carolina*) is entirely terrestrial, numerous everywhere and very interesting in its habits. In this family, also, fall the various land-tortoises (q.v.) of the type-genus Testudo. Most of the foregoing are terrestrial or fresh-water forms, while the remainder are marine and have the limbs modified into swimming paddles or 'flippers.' The family Chelonidæ contains many great extinct forms, from the Cretaceous to recent times, and a few existing species, of which the green turtle, hawksbill, and loggerhead (qq.v.) are representatives. The order Trionychoidea contains only the family Trionychidæ, which have no rigid plates on the flat carapace, but a soft leathery skin, and the plastron imperfect. See SOFT-SHELLED TURTLE.

FOSSIL TURTLES. The origin of the Chelonia is uncertain. Otocœlus, an armored cotylosaur from the Permian of Texas, has been suggested by Cope as a possible progenitor, but the relationship is extremely doubtful. Certain characters of shoulder-girdle and ventral abdominal ribs in the plesiosaurs indicate that this order may have genetic affinity with the turtles, and the dicynodonts and placodonts of Triassic age resemble turtles remarkably in many structures of the skull and limb-bones. (See THEROMORPHA.) All these groups belong to the synapsid division of Reptilia. Little evolution is demonstrable within the chelonian order from its first appearance in the European Upper Trias to the present, except in the degeneration of the carapace and elongation of the digits in the marine forms. The oldest turtle known is Proganochelys, from the Keuper (Upper Trias) of Germany. A probably primitive character in this genus is the well-developed row of supra-marginal plates. The Lower Jurassic strata have, as yet, yielded no chelonian remains, but in the Upper Jurassic, Cretaceous, and the Tertiary they are abundant, chiefly in the Northern Hemisphere. The existing suborders Cryptodira and Pleurodira appear to be fully differentiated in the Upper Jurassic, the Trionychia in the Upper Cretaceous of North America. As a rule the known Jurassic turtles have a solidly roofed skull like that of the recent green turtle, and a well-developed carapace. Professor Baur's opinion is that the earliest turtles were swamp-turtles, and that the soft-shelled Trionychia and the marine families evolved from these along one line, and the land tortoises along another.

Cryptodira is the suborder most widely represented among fossils, as among recent turtles. Several of the existing families, including the marine Chelonidæ and the 'leather-turtles,' are already differentiated in the Cretaceous, and in the Lower Eocene the highly specialized land-tortoises appear. Of the Cretaceous sea-turtles some attained enormous size; Protosphargis from Italy had a shell nine feet long, and in the North American Archelon the skull alone measures three feet. The suborder Pleurodira is widely distributed as fossils in various Mesozoic systems. Miolania, from the Pleistocene of Queensland, was a huge creature in which the head was armed with bony 'horns.' The third suborder, Trionychia, is known from the North American Cretaceous and the Tertiary of both hemispheres. The group shows scarcely any change from its first appearance to the present.

Bibliography. Consult standard works and authorities cited under Reptile and Tortoise; Boulenger, *Catalogue of Chelonians in British Museum* (London, 1889); Gadow, *Amphibia and Reptiles* (London, 1901); L. Agassiz, *Contributions to the Natural History of the United States* (Boston, 1857). Most of the literature on fossil Chelonia consists of special papers in scientific periodicals. The most important ones are by G. Baur and E. Fraas in Germany, Boulenger and Gadow in England, and O. P. Hay in America.

TURTLE-DOVE. See Dove; Pigeon.

TUR'TON. A cotton-manufacturing town in Lancashire, England, 4½ miles northeast of Bolton (Map: England, D 3). Population, in 1901, 12,353.

TURVEYDROP, Mr. A dancing-master in Dickens's *Bleak House*, said to have been modeled on George IV. He poses as a 'model of deportment' and is supported by his devoted son.

TUS'CALOO'SA. The county-seat of Tuscaloosa County, Ala., 56 miles southwest of Birmingham, on the Black Warrior River, and on the Alabama Great Southern and the Mobile and Ohio railroads (Map: Alabama, B 2). The University of Alabama, opened in 1831, is a mile north of the city. Other educational institutions are the Tuscaloosa Female College (Methodist Episcopal South), opened in 1860; the Alabama Central Female College; the Verner Military Institute; and Stillman Institute (Presbyterian), a colored theological school, opened in 1870. The State Insane Hospital, the old State Capitol building, and the bridges spanning the Black Warrior also are noteworthy features. The commercial importance of the city has been increased by extensive improvements on the river, adding considerably to the distance open to navigation. Coal is extensively mined in the vicinity, and at Holton, a suburb, there are large iron furnaces, coke ovens, and a by-product plant. Tuscaloosa is the centre of large cotton interests, and its principal industrial establishments are connected with cotton. Under the revised charter of 1878-79, the government is vested in a mayor, chosen biennially, and a common council. Tuscaloosa was settled about 1812, and was first incorporated some four years later. It was the capital of the State from 1826 to 1846. Population, in 1890, 4215; in 1900, 5094.

TUS'CANY (It. *Toscana*). Formerly a sovereign grand duchy, now a district (compartimento) on the west coast of Italy (Map: Italy, F 4). It comprises the maritime provinces Grosseto, Livorno (Leghorn), Lucca, and Pisa, the inland provinces Arezzo, Florence, and Siena, and the Province of Massa e Carrara, extending from the sea northward between Liguria and the Apennines. The greater part of Tuscany is mountainous, the Apuan Alps reaching 6385 feet and Mount Amiata 5655 feet. The principal rivers are the Arno, Cecina, Ombrone, and Serchio, all flowing into the Mediterranean. Except in the Maremma, a large marshy region on the southern coast, the climate is mild and healthful. The leading mineral deposits include iron, mercury, borax, copper, and salt; there are many mineral and thermal springs. Among the important agricultural products are wheat, maize, the vine, the olive, and tobacco. For population, see section on that topic under Italy.

Tuscany corresponds nearly to ancient Etruria (q.v.). The Etrurians or Tuscans were the earliest inhabitants known to history. They were conquered by the Romans, by whom in later times the land was called *Tuscia*. During the period of barbarian migrations Tusciæ was possessed in turn by the Ostrogoths, the emperors of Constantinople, and the Lombards. The last were conquered by Charles the Great and a Frankish margrave or duke was established with Lucca as his residence. Tuscia formed a part of the Kingdom of Italy, or of the Lombards. In 1030 Boniface II. of the House of Canossa became Duke of Tuscany. He was also Count of Modena, Reggio, Mantua, and Ferrara. His granddaughter, the Countess Matilda (q.v.), known as 'the Great Countess,' was an ardent friend of Pope Gregory VII., and one of the most powerful supporters of the Papal party during the Investiture struggle. At her death, in 1115, she bequeathed all of her wide dominions to the Papacy; but the German emperors claimed the duchy as an Imperial fief, and for more than a century 'the property of Matilda' was the cause of constant strife between the popes and the emperors. During this period the principal cities became independent and prosperous. Pisa had risen to independence and power long before this, and was now a great maritime republic. At the close of the thirteenth century she succumbed to the power of her rival Genoa. For several centuries the history of Florence is to a great extent the history of Tuscany. At the close of the twelfth century she was at the head of the Tuscan league of cities formed to resist the Hohenstaufen. This brought her into close alliance with the Papacy, and usually Florence remained a firm adherent of the Guelph Party.

In the fourteenth century Dante, Giotto, Petrarch, and Boccaccio made Tuscany preëminent in the revival of letters and arts. The Tuscan dialect became the literary language of Italy. In 1406 Pisa submitted to Florence and soon after she became mistress of Leghorn. Internal dissensions in Florence led to the establishment of the predominance of the Medici (q.v.). Cosimo de' Medici got control of affairs in 1434 and made the supreme power in Florence the hereditary possession of his house. In 1532, through the instrumentality of the Emperor Charles V., Alessandro de' Medici was made Duke of Florence. He was assassinated in 1537 and Cosimo the Great became Duke. The latter added to the territories of the duchy, especially by receiving Siena from Charles V. This gift bound him more closely to Spain and for nearly two hundred years Tuscany was generally under the influence of Spain. In 1569 the Florentine dominions were erected into the Grand Duchy of Tuscany. The House of Medici became extinct in the male line in 1737. By the terms of the Treaty of Vienna, which had been concluded in 1735, the grand duchy was given to Francis of Lorraine, the husband of Maria Theresa of Austria. Grand Duke Ferdinand III. was dispossessed by the French in 1799. By the Treaty of Madrid between France and Spain, in 1801, Tuscany was erected into the Kingdom of Etruria and given to the son of the Duke of Parma. In 1807 Napoleon took possession of the country, which was united with France. Elisa Bocciochi, the sister of Napoleon, received the title of Grand Duchess of Tuscany. In 1814 Ferdinand III. was reinstated and ruled until 1824. His successor, Leopold II., did much to promote the prosperity of Tuscany. In 1847 Lucca was annexed to the grand duchy. In February, 1848, Leopold granted a liberal constitution to his subjects, but the tide of revolution carried everything before it, and early in 1849 the Grand Duke fled from his country. A counter-revolution was soon set on foot by the Moderate Liberal Party and in a few months Leopold was restored to his throne. In 1850 he entered into a convention with Austria by which Austrian troops were to occupy Tuscany, and, thus supported, he reinstituted a régime of absolutism. In 1859, in consequence of his pro-Austrian policy, he was obliged to leave his State, which was occupied by the forces of Victor Emmanuel. On March 15, 1860, the people by a plebiscite voted the union of Tuscany with Italy.

For the early history of Tuscany, consult the histories of Florence, Pisa, and Arezzo, especially Perrens, *Histoire de Florence* (Paris, 1877-90). For the later history, consult Reumont, *Geschichte Toscanas seit dem Ende des florentinischen Freistaates* (Gotha, 1876). For the nineteenth century, Seignobos, *Political History of Europe Since 1814*, translated by Macvane (New York, 1899), gives a convenient summary and furnishes an ample bibliography.

TUS'CARO'RA. An important Southern tribe of Iroquoian stock (q.v.). When first known about the year 1670 they resided along the Neuse River in eastern North Carolina, where in 1700 they occupied fifteen villages with an estimated population of 1200 warriors or about 6000 souls, and held paramount influence over all the smaller tribes of that section. They were hostile to most of the leading Southern tribes, but maintained a close friendship with the Northern Iroquois (q.v.), whom they knew as traditional kinsmen. In consequence of encroachments upon their lands, they rose against the whites in September, 1711. A war of two years ensued, in which both Carolina provinces joined forces, together with a great body of Indian allies, against them. Finally defeated, the Tuscarora abandoned their country and fled north to the Iroquois, who received them as the sixth tribe of their confederacy, henceforth known as the 'Six Nations.' A part of the tribe which had remained friendly during the struggle was settled upon a small reservation on the Lower Roanoke River in North Carolina. Here they lingered for a time, until, weary of the attacks of hostile tribes and the constant encroachments of the whites, they also gradually withdrew to the north. Like the other tribes of the Iroquois confederacy, they were divided in the Revolutionary War, a part joining the English, while the rest adhered to the American side, with the result that they are now about equally divided between New York and Canada. Those in the United States number about 370 on a small reservation near Niagara Falls, and are civilized and fairly prosperous farmers, nearly all Christianized, although retaining their own language and chief system. About as many more are with the other Iroquois on Grand River Reservation, Ontario.

TUSCULAN DISPUTATIONS (Lat. *Tusculanæ Disputationes*). A philosophical work in five books by Cicero (B.C. 44), dedicated to M. Brutus. The conversations are supposed to be held at Cicero's estate at Tusculum. Each book discusses a different question of philosophy and treats of the troubles attending human happiness and their cure.

TUS'CULUM. An ancient city of Latium, about fifteen miles south of Rome, situated on a ridge of hills known as the *Colles Tusculani*, and forming part of the Alban range. Mythically, it derived its origin from Telegonus and Circe; but we catch the first certain glimpse of its historical existence toward the close of the regal period at Rome, when it had attained a high degree of prosperity and power. Octavius Mamilius, ruler of Tusculum, and the foremost prince in Latium, married a daughter of Tarquin the Proud (see TARQUINIUS), and played a conspicuous part in the last of the great struggles made by the banished tyrant to regain his kingdom. As early as B.C. 378 the inhabitants of Tusculum received the Roman franchise. Toward the close of the Republic Tusculum became a famous country residence of the wealthy Romans. Long after the Western Empire had fallen Tusculum continued to flourish. As late as the twelfth century the ancient city continued entire; but in 1191 it was stormed by the Romans and razed to the ground. Many fine remains of ancient Tusculum have been dug up in recent times, the most remarkable, perhaps, being the amphitheatre, theatre, and city walls.

TUSKEGEE (tŭs-kē'gē) **NORMAL AND INDUSTRIAL INSTITUTE.** An institution for the training of young colored men and women at Tuskegee, Ala., established in 1881 by an act of the Legislature under the name of the Tuskegee State Normal School, with an appropriation of $2000. It was opened July 4, 1881. In 1883 the appropriation was increased to $3000 and in 1893 the institution was incorporated under its present name. In 1903 the attendance had grown to 1497, while nearly the same number of applicants were refused for lack of accommodations. At the same time 112 instructors were engaged in the various departments. The library contained 13,000 volumes. The endowment was $1,010,000, including a gift of $600,000 from Mr. Andrew Carnegie, and the total value of the school property, including 62 buildings, land and plant worth $625,000, was $1,635,000. The property immediately belonging to the school consisted, in addition to the buildings, of 2631 acres of land, 1100 head of live stock, and more than 60 vehicles of various kinds.

The object of the institute is to furnish its students, thorough moral, literary, and industrial training, an education fitting them to become the real leaders among the people of their race, and thus to bring about healthier moral and material conditions. The institute also aims, through the Phelps Hall Bible Training School, to fit young men and women for the ministry and other forms of Christian work. Its constant purpose is so to correlate the literary and industrial training that the students may not get the one without the other. Students are admitted on passing an examination in reading, writing, and the fundamental operations of arithmetic. Instruction is given in two sessions. The day school is intended for students able to pay all or the greater part of their expenses in cash. They attend school in the daytime four days each week, and are required to work only six days a month. The night school is designed for students too poor to pay even the small charge made in the day school. Tuition is free. The monthly charge for board and living expenses is $8, of which day-school students may work out from $1.50 to $3 a month, while pupils of the night school are allowed to work out at least all of their board for the first six months. In all cases the labor of the students must be satisfactory in order to be accepted as part payment, and no student is paid more than $12 per month in excess of his board, while no part of the wages is paid in cash.

The discipline is strict, particularly in questions of morals. The studies of the academic department are closely associated with practical work in the field and shops. The department of mechanical industries includes mainly industries for young men. Instruction and practice are given in architectural and mechanical drawing, steam and electrical engineering, blacksmithing, brickmaking, carpentry, canning, founding, harness-making, carriage-trimming, machinery, painting, printing, saw-milling, shoemaking, tinsmithing, tailoring, and wheelwrighting. The industries for girls include sewing, dressmaking, millinery, cooking, laundering, domestic service, mattress-making, basketry, and nursing. So far as possible the product of the students' work is used in the institute and the surplus is sold. Each department is provided with a good equipment for practical work. The printing office, supplied with all needful apparatus, furnishes all the printed matter of the school, and issues a weekly and a monthly newspaper for the institution, beside three others for outside. Many of the school buildings, including the new Carnegie Library, are the product of student labor. In the agricultural department young men are trained to become intelligent and successful farmers by theoretical instruction in scientific principles, and their application in the field, orchard, dairy, and truck garden. To some of the agricultural courses women are admitted. Extension work is carried on through the Tuskegee Annual Conference, for the benefit of farmers of the South, and through the Russell Plantation work, under the direction of Mr. Booker T. Washington (q.v.), who has been the principal of the institute since its foundation.

TUSK-SHELL, or TOOTH-SHELL. A scaphopod mollusk of the genus Dentalium, common in the ocean on muddy bottoms at the depth of from ten to forty fathoms, as well as in very deep water. The shell is shaped like a gently curved elephant's tusk and is open at each end. The animal has no head, eyes, or heart, though it has a small elongated digging foot. Its genus first appears in the Eocene rocks. These shells were formerly extensively used by the Northwest Coast Indians as material for making necklaces and adorning clothing, and were circulated as a shell money (q.v.), called 'hi-qua.'

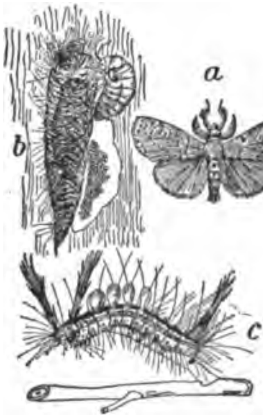
TUSSAUD, tṳ'ső′, MADAME MARIE (GRESHOLTZ) (1760-1850). Founder of the London waxworks exhibit on Marylebone Road. She was born at Bern, and learned at Paris the art of wax-modeling, in which she subsequently instructed Madame Elisabeth, sister of King Louis XVI. After a three months' imprisonment during the French Revolution, she brought to London her collection, afterwards increased to include about 300 figures. There is connected with it a "Chamber of Horrors," with relics of criminals and a collection of instruments of torture. Consult Hervé, *Memoirs of Madame Tussaud* (London, 1878), which, however, is not altogether reliable.

TUSSEH, or TUSSER. See SILKWORM.

TUS′SER, THOMAS (c.1524-80). An English rhymer, said by himself to be of gentle birth. He was born at Rivenhall, near Witham, in Essex. He was educated at Eton and at Cambridge. For ten years he was a musician in the service of Lord Paget of Beaudesert, and thus lived at Court. He then settled for a time as farmer in Suffolk, and thereafter moved about from place to place, eventually dying in a debtor's prison at London. He is remembered for *Five Hundreth Poyntes of Good Husbandry united to as many of Good Huswifery*, a homely proverbial poem, to which is prefixed an autobiography in verse (1573). Based upon earlier issues, beginning with a *Hundreth Good Pointes of Husbandrie* (1557) and a *Hundreth Poyntes of Good Husserie* (licensed 1557), this poem went through several editions. Consult the reprints, ed. by W. Payne and S. J. Herrtage for the English Dialect Society (London, 1878).

TUS′SILA′GO (Lat., coltsfoot). A genus of plants of the natural order Compositæ. *Tussilago Farfara*, sometimes called coltsfoot, is the only species. It has solitary flower-heads on scaly scapes, appearing before the leaves in early spring. Both disk and ray flowers are yellow, the leaves heart-shaped, angular, downy beneath, somewhat glutinous and subacrid. The leaves of the butter bur (*Petasites officinalis*), which has been naturalized from Europe, resemble those of Tussilago, but are much larger; the pale flesh-colored flowers also appear before the leaves, but are in a dense thyrsus. The flowers of both are much sought after by bees.

TUSSOCK-MOTH. Any moth of the family Liparidæ, a name suggested by the tufts of hairs, often bright-colored, upon the caterpillars. The moths are dull-colored and the females of some species are wingless. Twenty species occur in the United States. The group includes some famous enemies of fruit, shade, and forest trees. Two imported species, the gypsy moth (q.v.) and the browntail moth (*Euproctis chrysorrhœa*), do great damage in New England. The latter species flies during midsummer, when the female lays from 200 to 300 eggs underneath leaves near the tips of branches and covers them with hair. The larvæ appear in from two to three weeks, and skeletonize the leaves. They also feed on apple and pear fruits. In late September they retire into cases formed of leaves, attached to the twigs by silken threads, and remain there until the leaf-buds open in the spring, feeding upon the young foliage, flowers, and fruit until June, when they pupate. The caterpillars when abundant are annoying to human beings from the mechanical irritation to the skin caused by their barbed hairs.



TUSSOCK-MOTH.

a, Adult male of *Hemerocampa leucostigma*; *b*, cocoon fastened to the wall, and wingless female carrying egg-sac; *c*, caterpillar.

The white-marked tussock-moth (*Hemerocampa leucostigma*) is a well-known enemy of shade and fruit trees in the Eastern United States. The female is wingless, the male small and inconspicuous. The overwintering eggs are laid in a glistening white frothy mass, attached to the outside of the female's cocoon, which is usually placed on a tree trunk. The young caterpillars hatch in the spring and feed upon the leaves. There are two or three generations each year. Winter pruning and burning of the hibernacula of the former species, and summer spraying the larvæ of the latter with arsenites, have been recommended. Consult Holland, *The Moth Book* (New York, 1903).

TUTELO, tōō-tā′lō, or **TOTERO**. An eastern tribe of Siouan stock, calling themselves Yesañ, formerly living on the Upper Roanoke and Dan rivers, in Virginia and North Carolina, in close alliance with the cognate Saponi (q.v.). They were first visited in 1670 by the German traveler John Lederer, who calls them Nahyssan. They were already well acquainted with the Virginia traders, but had then been for ten years at war with the whites. They were visited again the next year by an exploring expedition under Thomas Batts. We hear little of them after this until 1701, when Lawson found them in what is now central North Carolina, preparing to move to the settlements for protection against the Iroquois, who had driven them from their former villages on the Roanoke. They were then so much reduced in number as to be unable any longer to make defense against their enemies. The refugee tribes were soon afterwards settled by Governor Spotswood of Virginia near Fort Christanna, in what is now Brunswick County, Va., where they remained until about 1740, when, peace having at last been made with the Iroquois, they removed to the north, together with the Saponi, and settled on the Susquehanna at Shamokin, now Sunbury, Pa. Later they were adopted by the Cayuga, thus becoming a component part of the Iroquois League. Their village near Cayuga Lake being destroyed by Sullivan in 1779, they fled with the Cayuga to Canada and found their final home with the Iroquois on the Grand River Reservation, in Ontario, locating on Tutelo Heights, near Brantford. Successive visitations of cholera in 1832 and 1848 exterminated the remnant, and in 1870 there survived but one fullblood.

TUT′ICOR′IN. A seaport in the District of Tinnevelli, Madras, India, 443 miles by rail south by west of the city of Madras, on the Gulf of Manar (Map: India, C 7). The manufacturing establishments are chiefly connected with the cotton industry. Pearl-fishing, formerly the principal industry, has greatly declined in importance. Population, in 1901, 28,048.

TUT′TIETT, M. G. An English novelist, better known under her pen-name, Maxwell Gray (q.v.).

TUTTLE, tŭt′'l, HERBERT (1846-94). An American historian, born at Bennington, Vt. He graduated in 1869 at the University of Vermont, and for some time was a journalist in Boston, Paris, and Berlin. From 1880 to 1881 he was a lecturer on international law at the University of Michigan, and in the latter year was appointed to the chair of politics and international law in Cornell University. He was subsequently transferred to the chair of modern European history, which he held until his death. He published: *German Political Leaders* (1876); *History of Prussia to the Accession of Frederick the Great* (1884); and a *History of Prussia Under Frederick the Great* (1888). There is a biographical sketch by Prof. H. B. Adams in the fourth volume of the *History of Prussia*.

TUTTLINGEN, tōōt′lĭng-en. A town of the Kingdom of Württemberg, Germany, on the right bank of the Danube, 64 miles southeast of Strassburg (Map: Germany, C 5). It has shoe factories, tanneries, and manufactures of surgical instruments, cutlery, leather, and woolen goods. Population, in 1900, 13,465. Tuttlingen is historically notable as the scene of a battle in 1643, during the Thirty Years' War, in which an Austro-Bavarian force, under Hatzfeld and Mercy, defeated the French.

TUTUILA, tōō′tōō-ē′lȧ. An island of the Samoan group belonging to the United States, and situated 46 miles southeast of Upolu (Map: Guam, D 3). Area, 54 square miles. Its surface is mountainous and picturesque with luxuriant forests and there are numerous signs of volcanic activity. Tutuila contains the best harbor of the Samoan group, Pago Pago (q.v.) or Pango Pango. The exports from the island in 1901, consisting chiefly of copra, amounted to $22,308, while the imports were valued at $82,165. The population is estimated at 3800, chiefly Samoans. Tutuila, together with the Manua group and a few other islands belonging to the United States, is administered by a naval Governor. The chief town is Leone, on the southern coast. See SAMOAN ISLANDS.

TUXTLA GUTIERREZ, tōōs′tlȧ gōō′tȧ-ār′rȧs. The capital of the State of Chiapas, Mexico, 270 miles southeast of Vera Cruz (Map: Mexico, M 9). The principal building is the Government palace. The main industries are tanning, indigo preparations, and general commerce. Population of the municipality, in 1895, 10,982.

TÚY, tōō′ē. A Spanish frontier town of the Province of Pontevedra, in Galicia, on the right bank of the Miño, 63 miles north of Oporto, Portugal (Map: Spain, A 1). The cathedral is a fortress-like structure. The international iron bridge spanning the Miño is worthy of note. The town is in the midst of the fertile Vega del Oro, celebrated for the culture of fruits, vegetables, and silks. Tanneries and soap factories, with a brisk trade with Portugal, form the chief industries of the town. The population of the ayuntamiento in 1900 was 11,631.

TUY. A town of Luzon, Philippines, in the western part of the Province of Batangas. It lies about 24 miles northwest of Batangas (Map: Luzon, D 11). Population, 10,150.

TVASHTAR, tväsh′tȧr (Skt. *tvaṣṭṛ*, creator, from *tvakṣ*, *takṣ*, to fashion; connected with Av. *θwaxš*, to create, Gk. *τέκτων*, *tektōn*, carpenter, *τίκτειν*, *tiktein*, to beget, Lat. *texere*, to weave, OChurch Slav. *tesla*, OHG. *dehsala*, axe). A divinity of Vedic Hindu mythology. He is especially the divine artificer, and among his chief works are the thunderbolt of Indra (q.v.) and a cup for the beverage of the gods. Similarly he is the deity who fashions all living forms, both of men and of animals, so that in later texts he is said to have produced the whole world, and to have been the ancestor of all mankind. He is also a creator of gods, particularly of Brihaspati (q.v.), Agni (q.v.), and, probably, Indra, although this god caused his sire to tremble. The mythological basis of Tvashtar is very doubtful. Of the numerous explanations proposed, that which makes him the creative aspect of the sun, with the moon as his cup, is perhaps the most plausible. Consult Macdonell, *Vedic Mythology* (Strassburg, 1897).

TVER, tvĕr. A government of Central Russia. Area, 25,225 square miles (Map: Russia, E 3). The surface is largely an elevated plain intersected by deep river valleys. The northwestern part is hilly. The government is watered chiefly by the Upper Volga with its tributaries and the Dvina. The soil is not fertile and the supply of grain is insufficient to meet the domestic demand. The household industry is well developed, entire sections of the government being engaged in the production of footwear, felt goods, linen, nails, axes, agricultural implements, etc. The local manufactures in 1898 yielded an output of $16,000,000, chiefly cotton goods, flour, leather, spirits, etc. Population, in 1897, 1,812,825.

TVER. The capital of the Government of Tver, situated on the Volga, 298 miles southeast of Saint Petersburg (Map: Russia, E 3). It has a thirteenth-century monastery and an Imperial palace occupied by the Governor. Tver is one of the chief cotton-manufacturing centres of Russia. There are also flour mills, wagon factories, saw mills, etc. Population, in 1897, 53,477. Tver dates from 1180 and was the capital of an independent principality from the thirteenth century to the end of the fifteenth, when it was annexed to Moscow.

TWACHTMAN, JOHN HENRY (1853-1902). An American landscape painter, born in Cincinnati, Ohio. He was a pupil at the Cincinnati School of Design, and of Frank Duveneck, and studied in Munich under Löffts, and with Boulanger and Lefebvre in Paris. He has been considered one of the most consistent of American impressionists. Some of his later landscapes show many subtle effects of light, and sensitive gradations of tone. In delicate elusive color schemes he is more successful than in pretentious paintings, such as the Niagara and Yellowstone Park series. His sketches in pastel, such as "Wild Flowers," "Meadow Flowers," and "The Old Gate," are among the most personal and delightful of his productions. His other works include: "Snow Storm;" "Melting Snow;" "Hemlocks;" "The Poplars;" "Willows and Golden Rod;" "Inner Harbor, Gloucester;" and "Drying Sails."

TWAIN, MARK. See CLEMENS, SAMUEL L.

TWAITE. A poor sort of European shad (*Clupea finta*). See ALLICE.

TWEED. A river of southern Scotland. It rises 15 miles southwest of Edinburgh and flows in a generally eastward direction, emptying into the North Sea at Berwick (Map: Scotland, F 4). It is 97 miles long, but unnavigable. For 18 miles of its lower course it forms the boundary between England and Scotland, and it flows through one of the most historic regions of Great Britain, the celebrated 'Borders.'

TWEED. A twilled woolen fabric (see WEAVING), often woven in two colors, the yarn being dyed before weaving. It is a soft, flexible, durable material, unmixed with shoddy or cotton. Its name is derived from the locality where it was first manufactured—in villages along the Tweed, in Scotland.

TWEED, WILLIAM MARCY (1823-78). A notorious American politician, leader of the so-called 'Tweed Ring,' born in New York City. He was the son of a chair-maker, was prepared for the same occupation, receiving slight education, and early entered politics, becoming an alderman of New York City, and taking a seat in Congress in 1853. Subsequently he was a School Commissioner; became a member of the Board of Supervisors of New York County, and was president of the board for four successive terms. From 1867 to 1871 he was a State Senator. A member of the Tammany Society for many years, he was grand sachem in 1869-71. He was appointed Deputy Street Commissioner in 1861, and when in 1870 that department was changed to the Department of Public Works, he was the Commissioner at its head, a position which enabled him to initiate, as is generally believed, the formation of the combination known as the 'Tammany Ring,' or the 'Tweed Ring.' The 'ring,' having placated the Mozart Hall faction of Fernando Wood (q.v.), elected its candidate for Mayor in 1865, and its candidate for Governor in 1868, and so controlled the Legislature as to secure such a modification of the city's charter as greatly to increase the power of the offices held by the 'ring.' Legislators and judges were bribed, and bills were passed and decisions rendered in favor of the members of the 'ring.' Gigantic schemes of city improvement were organized and carried out successfully, though accompanied generally with much peculation. Fraudulent bills were audited, and their sum divided among the thieves. Probably no other such complete plan of public spoliation was ever devised and executed in any country. The exposure of this vast system of peculation was made largely by the New York *Times*, through the intervention of a disappointed enemy of the 'ring,' in July, 1871; a vigorous investigation and prosecution was undertaken by a committee of seventy citizens, under the lead of Samuel J. Tilden (q.v.); and Tweed was indicted in 1872 for forgery and grand larceny. Two trials were held, and in 1873 Tweed was convicted, and sentenced to twelve years' confinement in the penitentiary, and to pay a fine of $12,300.18. He was confined on Blackwell's Island from November, 1873, until June, 1875, when he was released by a decision of the Court of Appeals, on a legal technicality. He was immediately rearrested on a warrant issued in a civil suit for $6,198,957.85, and sent to Ludlow Street Jail. Being permitted to go out to drive with an officer, he made his escape, and fled to Spain. He was returned in November, 1876, and again incarcerated in Ludlow Street Jail until April 12, 1878, when he died. Much material relative to Tweed is to be found in Myers's *History of Tammany Hall* (New York), and in Breen's *Thirty Years of New York Politics* (ib., 1899). See also chapter 88 of James Bryce, *The American Commonwealth* (ib., 1889), on "The Tweed Ring," by F. J. Goodnow.

TWEED'DALE, JOHN HAY, Marquis of (1626-97). A Scotch soldier and statesman, second Earl of Tweeddale (1654). After serving in the King's army (1642) he fought against Charles, at Marston Moor (1644), and, four years later, commanded at Preston in the King's army again. He was sent to Parliament in 1654; became Privy Councilor on the Restoration and president of the Council in 1663; and in the next year was appointed High Commissioner on Ecclesiastical Affairs. In this post he labored for a more lenient attitude toward Covenanters; and from it he was removed in 1674, by the influence of Lauderdale. He was restored to some of his old posts in 1680 and 1682; held office under James II., but, disliking his Scotch policy, joined the Revolution; and, in 1689, became Privy Councilor under William and Mary. He was a commissioner on the Glencoe massacre and was dismissed by the King in 1696 for assenting to the Colonization Act and Paterson's schemes in Darien.

TWEEDLEDUM AND TWEEDLEDEE. An expression denoting an inappreciable difference between unimportant points. The phrase was used by Byron in a satire on the feud between the partisans of Handel and Buononcini.

TWEEDMOUTH, twēd'mŭth, EDWARD MARJORIBANKS, second Baron (1849—). An English statesman, born in London. He was educated at Harrow and Oxford, became a barrister in 1874, and was a Liberal member of Parliament for Berwick in 1880-94. In 1886 he was made Comptroller to the Household, and in 1892-94 he was Parliamentary Secretary to the Treasury and chief Liberal whip. In 1894-95 he was Lord Privy Seal and Chancellor of the Duchy of Lancaster.

TWELFTH NIGHT, OR WHAT YOU WILL. (1) A comedy by Shakespeare, played at Middle Temple Hall, Twelfth Night, 1602, according to J. Manningham's diary. The principal plot was taken from Bandello's tale, perhaps through Belleforest's *Histoires Tragiques*, or B. Rich's *Apollonius and Silla*, adapted from Ciuttico's *Hecatommithi*. A similar plot is found in two Italian plays, *Gl'Ingannati* (1537), and *Gl'Inganni* (1592). Malvolio, Sir Toby, Sir Andrew, and the clown, are all Shakespeare's. (2) A festival twelve days after Christmas. See EPIPHANY.

TWELVE, GOSPEL OF THE. See APOCRYPHA.

TWELVE TABLES, LAW OF THE. The earlier systematic written statement, or code, of Roman law. According to the Roman tradition, this code was drawn up to appease the plebeians, who complained that the unwritten customary law, as interpreted by patrician priests and applied by patrician judges, gave no adequate protection to their liberties. In B.C. 452 ten magistrates were elected "to write laws" (*decemviri legibus scribendis*), and before the end of the following year ten tables of laws were submitted to and accepted by the popular assembly. In B.C. 450 two supplementary tables were similarly adopted. The decemvirs claimed that they had made the law equal for all, high and low; and there is no doubt that the Roman people regarded the XII. Tables with great veneration, as a bulwark of personal liberty.

This code seems to have introduced little if any new law, being substantially a re-statement of the older custom. Its rules were simple, and were tersely and clearly expressed. It contained no constitutional law, and it dealt mainly with the law of family, property, crimes, torts, and civil procedure. It did not state the law fully even in these matters, for (as in other early codes) rules that were so well settled as to be indisputable were not included.

The XII. Tables have come down to us in fragments only. In Roman legal, historical, and grammatical writings, a couple of score of passages are directly cited, and it is sometimes stated in which of the tables the rule stood. Other rules are paraphrased or indicated by allusions. Attempts to reconstruct the code have been made by Gothofredus (1616), Dirksen (1824), Schoell (1866), and Voigt (1883). The text commonly given in works on Roman law is that of Schoell, and citations of table and law by number are regularly based on his reconstruction.

The credibility of the Roman tradition concerning the origin of the XII. Tables has been energetically attacked by recent writers, who assert that the tradition is of late origin and that the XII. Tables are a private compilation made, probably, in the third century B.C.

Consult: Voigt, *Geschichte und System des Rechts der XII Tafeln* (Leipzig, 1883); Appleton, *Le testament romain et l'authenticité des XII Tables* (Paris, 1903); Lambert, *L'Histoire traditionelle des XII Tables* (Lyons, 1903). See CIVIL LAW.

TWES'TEN, AUGUST DETLEV CHRISTIAN (1789-1876). A German Protestant theologian. He was born at Glückstadt, studied at Kiel and Berlin, and became professor of theology at Kiel, 1814. In 1835 he succeeded Schleiermacher, whose views he had adopted at Berlin. He was a member of the new supreme ecclesiastical council of the United Evangelical Church until his death. He published *Vorlesungen über die Dogmatik der evangelisch-lutherischen Kirche* (1826-37); *Grundriss der analytischen Logik* (1834); *Matthias Flacius Illyricus* (1844); and edited Schleiermacher's *Ethik* (1841). Consult Heinrici, *August Twesten nach Tagebüchern und Briefen* (Berlin, 1889), and *Life* by G. Heinrici (ib., 1889).

TWICH'ELL, JOSEPH HOPKINS (1838—). An American Congregational clergyman, born in Southington, Conn. He gradated at Yale in 1859, was chaplain of the 71st Regiment, New York State Volunteers, during the Civil War, and in 1865 became pastor of the Asylum Hill Congregational Church, at Hartford, Conn. His writings include *John Winthrop* (1891) and *Some Old Puritan Love Letters* (1893).

TWICK'ENHAM. A town in Middlesex, England, on the Thames, connected with Richmond, on the opposite bank, by a substantial bridge, 10 miles southwest of Saint Paul's, London (Map: London, F 4). It has interesting historic dwellings, and is a favorite holiday resort of Londoners. It contains the great Church of Saint Stephen's, completed in 1874; the estate of Alexander Pope, where the grotto is all that remains (Pope's monument is in the church); Walpole's villa, called Strawberry Hill; and the Orleans villa, temporarily occupied by Louis Philippe, and still owned by his descendants. Population, in 1891, 16,000; in 1901, 21,000. Consult Cobbett, *Memorials of Twickenham* (London, 1872).

TWIG-GIRDLER. See GIRDLER.

TWIGGS, DAVID EMANUEL (1790-1862). An American soldier. He was born in Richmond County, Ga., and was the son of General John Twiggs, a soldier in the Revolution. In March, 1812, he was appointed captain in the Eighth Infantry. He served in the War of 1812, and was promoted major in September, 1814. He later fought against the Seminole Indians, and then in the Black Hawk War, and was commissioned colonel of the Second Dragoons in June, 1836. For services at Palo Alto and Resaca de la Palma, where he commanded the right wing of General Taylor's army, he was brevetted brigadier-general. In the attack on Monterey he commanded a division; was brevetted a major-general; and after a short term as Governor of Monterey was sent to join General Scott at Vera Cruz. In the advance on the City of Mexico he commanded the Second Division; led the main attack at Cerro Gordo; and performed important services at Contreras and Churubusco, and in the attack on the gates of Mexico. After the war ended he was for some years in charge of the Department of the West, and then of that of Texas. On the outbreak of the Civil War he surrendered, without resistance, the United States property under his charge to the Confederates, and in the North was generally regarded as a traitor. He was made a major-general in the Confederate service, and for a time commanded in Louisiana, but age and infirmities led him to resign from the service near the close of 1861.

TWIG-PRUNER. Any of several species of longicorn beetles of the genus Elaphidion, the females of which lay their eggs in the twigs of several kinds of trees. The eggs hatch and the larva when nearly full-grown severs the twig in which it is working, transforming to pupa within the twig after it has fallen to the ground. The common oak-pruner (*Elaphidion villosum*) is a rather slender long-horned beetle, dark brown in color, and covered with grayish pubescence. It feeds in the twigs of oak, hickory, chestnut, maple, apple, plum, peach, and other trees. The purpose of the amputation of the twig by the larva seems not primarily to be for the purpose of making the twig fall, but to penetrate through the wood to the bark in order that the beetle may have an easy exit. *Elaphidion subpubescens* works in the same way in the shoots of white oak, while *Elaphidion mucronatum* is found in the twigs of live oak and other trees. The larva of *Elaphidion unicolor* amputates the twigs of the redbud (*Cercis Canadensis*). A few other insects have somewhat similar habits. For example, certain horn-tails, notably the willow-shoot horn-tail (*Phyllœcus integer*), live, in the larval stage, in twigs of willow, which they cause to wilt, and easily to break from the branch.

TWILIGHT (from *twi-*, combining-form of *two* + *light*). A phenomenon caused by atmospheric refraction. (See REFRACTION.) When the sun sets below our horizon, we are not immediately plunged into the darkness of night. There is an intermediate period of partial and slowly increasing darkness which we call twilight. The cause is a simple one. Although the sun is below our horizon, rays of solar light are bent or 'refracted' by the terrestrial atmosphere, and continue to furnish some slight illumination. The process continues, with diminishing intensity, until the sun is so far below the horizon that the refracting power of the atmosphere is no longer able to bend the rays enough to produce a visible effect. This occurs when the sun is 18° below the horizon; and the time after sunset when the sun reaches such a position varies with the latitude of the place, and with the time of year.

TWIL'LINGATE or **TOULINGUET,** tōō-lăN'gā'. A port of entry on the Twillingate Islands in Notre Dame Bay, on the northeast coast of Newfoundland, 232 miles by steamer from Saint Johns (Map: Newfoundland, F 3). It is a prosperous fishing centre. Population, in 1891, 3585; in 1901, 3542.

TWIN-FLOWER. A hardy, trailing evergreen plant of the natural order Caprifoliaceæ. It is a favorite in rockeries on account of its dainty, bell-shaped, nodding, pink or white, fragrant flowers, which appear during midsummer in pairs upon erect, slender stems. It thrives best in open, peaty soil and in shade. In the woods it may be found as far south as Maryland and the mountains of California, but is more common northward.

TWIN FLOWER (*Linnæa borealis*).

TWI'NING, Kinsley (1832-1901). An American clergyman and editor, born at West Point, N. Y. He graduated at Yale in 1853, at the Yale Divinity School in 1856, was a resident licentiate at the Andover Theological Seminary in 1857, and from 1857 to 1876 occupied various Congregational pulpits. In 1880-98 he was literary editor of the New York *Independent*, and in 1898 became literary editor of the *Evangelist*. He was one of the founders of the Reform Club of New York City.

TWINING PLANTS. Plants whose axes are coiled about slender supports, e.g. common morning-glory and hop. In most cases the support must be slender (less than 15 centimeters in diameter), though some tropical plants coil about thick tree trunks, and others climb in a somewhat similar fashion by partial twining. (See Lianas.) The direction of twining varies with different plants, being either clockwise or counter-clockwise. While the direction of twining is usually constant in the same species, some twiners coil in either direction. The direction is not constant, however, among members of the same family, nor even among different species of the same genus.

The cause of twining has long been a problem of great difficulty. The most satisfactory explanation seems to be the following: Twining stems are endowed with a sensitiveness to the action of gravity, which may be distinguished as lateral geotropism (q.v.). The stem at first grows erect (on account of negative geotropism), but through unequal growth, causing nutation (q.v.), soon inclines to one side. At this period of its development, the flanks (i.e. the sides of the stem now on the right and left as distinguished from the upper and lower) are sensitive to their changed relation to gravity (on account of the new horizontal position), which thus becomes a stimulus. The response of the stem to this stimulus is an accelerated growth on one flank, the right or left, as the case may be. The acceleration of growth there swings the horizontal tip toward a new point of the compass, and at the same time, from mechanical necessity, partially rotates the stem on its longitudinal axis, so that a new side is brought into the flank position and therefore under stimulation. It then responds likewise with accelerated growth; this swings the tip still farther around, and again brings a new region under stimulation. By this continued action each side of the stem is successively stimulated, and the tip is therefore swung in a circle. At the same time it is elongating. If, in the course of its twining, the nearly horizontal tip strikes a support, only the part beyond the support continues to swing, and therefore begins to wrap around the support, forming coils which are at first low and loose. At a later period negative geotropism again asserts itself in this part of the stem, which grows so that it straightens, if possible, the actual effect being to steepen the coils and make them hug the support more closely. The slenderer the support, as a rule, the steeper are the completed coils. This explanation receives its strongest support from the fact that when the action of gravity is equalized, as it can be by rotating a seedling twiner on a clinostat (q.v.), no coiling takes place. There are various phenomena of twining, experimentally induced, of which no full explanation can yet be given. There is, however, no mere mechanical stoppage of the swinging tip which permits coiling, because it has no momentum, and because many twiners will coil about a loose cord. It is further probable that twiners are susceptible to the continued contact and pressure of the support, and that this plays some part in the method of climbing which they have adopted.

Twining plants are characterized by unusually long growing regions, and by the retarded development of foliage leaves. Thus, while in erect stems from 10 to 20 centimeters (4 to 8 inches) of the apex are still capable of elongation, in twining plants the elongating region is 30 to 50 centimeters (12-20 inches) long, or in some cases as much as 80 centimeters (32 inches). The slow development of the foliage leaves seems both to be correlated with this long maintenance of the power of growth, and to be necessary for twining, because the presence of fully developed foliage would interfere seriously with the free movements of the tip.

TWISS, Sir Travers (1809-97). An English jurist and scholar. He was born in Marylebone, London, graduated from University College, Oxford, with distinction, and published in 1836 his *Epitome of Niebuhr's History of Rome.* In 1840 he was called to the bar. From 1842 to 1847 he was professor of political economy at Oxford, from 1852 to 1855 professor of international law at King's College, London, and from 1855 to 1870 held the regius professorship of civil law at Oxford. He also held several ecclesiastico-legal positions, and in 1858 became chancellor of the diocese of London, the same year having been created

Queen's counsel. In 1867 he was appointed Queen's Advocate-General and was knighted. Owing to a scandalous libel of which he and his wife were the victims, in 1872 he retired to private life and devoted himself to juridical science and literature. In 1884 he drafted for the King of Belgium a constitution for the Congo Free State, and in 1884-85 was counsel extraordinary to the British embassy during the Berlin Conference. His chief works are: *View of the Progress of Political Economy in Europe Since the Sixteenth Century* (London, 1847); *The Oregon Territory; Its History and Discovery* (New York, 1846); but his fame rests principally on his treatise, *The Law of Nations* (1861-63), which, in the French edition, *Le droit des gens ou des nations* (Paris, 1887-89), is a standard work.

TWITCH'ER, Jemmy. A highwayman in Gay's *Beggar's Opera*, noted for treachery. This name became the popular nickname for Lord Sandwich, who turned against his former companion, John Wilkes.

TWITTER. A peculiar deformation of carnation plants, produced possibly by several kinds of insects: a plant-louse or green fly of the genus Siphonophora, a true thrips, and possibly the larva of some anthomyiid fly. The chances are that carnation twitter can be produced by any cause which checks the growth of the plant; hence any one of several insects may be involved.

TWO GENTLEMEN OF VERO'NA, The. A comedy by Shakespeare, probably produced in the original form in 1591, and in the present form in 1595; first printed in the folio of 1623. It may have been adapted from the lost play *Felix and Philomena,* acted in 1584, though the same story is told of the shepherdess Filismena in Montemayor's Spanish romance *Diana,* translated by B. Young and known in manuscript in 1583, and is also found in Rich's version of Bandello's *Apollonius and Silla.*

TWO NOBLE KINSMEN. A play produced in 1625 and published in 1634 as the work of Fletcher and Shakespeare. The latter's part, if any, was unimportant, and it was probably written by Massinger and Fletcher with Rowley. The story is that of Chaucer's *Knight's Tale,* taken from Boccaccio's *Teseide.*

TWO-SEED-IN-THE-SPIRIT BAPTISTS. See Baptists.

TWO SICILIES, Kingdom of the. The name commonly given to a former kingdom embracing Sicily and Southern Italy, and known often as the Kingdom of Naples. In the Middle Ages the southern part of the Italian mainland came to be known as 'Sicily on this side of the Faro' (the Strait of Messina). From the earliest times both the island and the mainland were subject to settlement and conquest by peoples of widely different stock, producing a complicated admixture of races. At the dawn of history the Phœnicians had trading settlements there. In the eighth century B.C. numerous Greek colonies were founded in both Sicily and Southern Italy and became powerful and wealthy States. A new Phœnician element was introduced when Carthage disputed the supremacy of Sicily with the Greeks. The Roman conquest followed. In the middle of the fifth century, at the time of the fall of the Roman Empire, Sicily was ravaged by the Vandals. Toward the close of the century the Ostrogoths made themselves masters of Italy and Sicily. In the sixth century their realm was conquered by the Byzantines. Soon after the Lombards established their sway over part of Southern Italy. The Lombard Duchy of Benevento was founded, out of which in the ninth century arose the three principalities of Benevento, Salerno, and Capua. By the side of these was the Duchy of Naples, a Byzantine creation. Apulia and Calabria were held by the Byzantines until the eleventh century. In the years from 827 to 878 the island of Sicily was conquered by the Saracens. Owing to dissensions among the Christians of Southern Italy, the Saracens likewise obtained a foothold on the mainland.

About 1037 the sons of a Norman knight, Tancred de Hauteville, setting out with a few followers to win their fortunes, entered Southern Italy in the service of the Byzantine Governor, but soon seized and divided Apulia and were able to hold the country against every effort of the Greeks to dislodge them. Robert Guiscard, one of these brothers, became Count of Apulia in 1057, and in 1059 he was recognized by Pope Nicholas II. as Duke of Apulia and Calabria. In 1061 his younger brother, Roger, with a few hundred Norman knights, began the conquest of the island of Sicily, which was made a county and a fief of Robert's duchy, though the total subjugation of the island was not accomplished till 1090, after Robert's death. In 1127 Roger II., son of the first Roger, united Apulia, Calabria, and Sicily, and in 1130 he assumed the title of King of Sicily. He extended his sway over the Abruzzi, made himself master of Capua, and received the submission of Naples. The marriage of Frederick Barbarossa's son, the later Emperor Henry VI., to Constance, heiress of the Two Sicilies, in 1186, united the destinies of the Norman kingdom with those of the House of Hohenstaufen, whose rule began in 1194. The child of this marriage, the Emperor Frederick II. (q.v.), was the most remarkable prince in the Europe of his day. He reorganized the government of the Sicilian kingdom on essentially modern lines, founded the University of Naples, and made his Court the brilliant centre of the highest culture and learning of his time. His death in 1250 was followed by the speedy downfall of the House of Hohenstaufen. In 1266 Charles of Anjou, brother of Louis IX. of France, at the instance of the Pope, undertook the conquest of the Two Sicilies. He vanquished Manfred, son of Frederick II., at Benevento, and in 1268 he defeated, captured, and executed Conradin, the last of the Hohenstaufen. Charles of Anjou made Naples his residence.

The year 1282 witnessed the fearful popular uprising against the French in Sicily known as the Sicilian Vespers (q.v.). The people shook off the yoke of Anjou and placed their island under the rule of Pedro III. of Aragon. The House of Anjou continued to rule in South Italy, which thus became the Kingdom of Naples. In 1296 Sicily was separated from Aragon, but continued under the rule of the Aragonese house, and in 1412 was reunited with that kingdom. Robert I. of Naples (1309-43) made himself the champion of the Guelph Party and extended his influence throughout Italy. He was succeeded by his granddaughter Joanna I. (q.v.), and an anarchic period began and continued for many years, the heirs of the elder Neapolitan line, which had also acquired the throne of Hungary, contending with new aspirants from Anjou. In 1399 the Neapolitan line triumphed in the person of the crafty and unprincipled Ladislas (q.v.). He died in 1414, leaving the kingdom to his sister, Joanna II. (q.v.). She was given up to sensuality, and the disorder was renewed. After her death in 1435 Alfonso V., King of Aragon and Sicily, undertook the conquest of Naples, of which he secured possession in 1442, reigning until his death in 1458. He left Aragon and Sicily to his eldest son, John, and Naples to his illegitimate son, Ferdinand, under whose rapacious and cruel rule new troubles arose. In 1495 Charles VIII. of France invaded Naples, and although he was compelled to withdraw in the same year, his successor, Louis XII., jointly with Ferdinand of Spain, conquered the country in 1501. Two years afterwards the Spaniards under Gonsalvo de Córdova (q.v.) drove out the French and made Naples a Spanish province.

The country was now subjected to the oppressive tyranny of Spanish viceroys. A formidable rebellion at Naples broke out in 1647 under Masaniello (q.v.). In 1707 the Neapolitan dominions were wrested from Spain by Austria during the War of the Spanish Succession. (See SUCCESSION WARS.) Naples was confirmed to Austria by the Treaty of Utrecht (1713) and Sicily was given to Savoy. In 1720 Sicily was transferred by Savoy to Austria in exchange for Sardinia. In 1734 Don Carlos, second son of Philip V. of Spain, of the House of Bourbon, and Elizabeth Farnese invaded the Two Sicilies, and in 1735 he was crowned and was recognized by the Treaty of Vienna as King Charles III. (See CHARLES III., King of Spain.) After the Peace of Aix-la-Chapelle (1748) Italy enjoyed nearly a half century of peace, and these years witnessed in the Two Sicilies progress along many lines, but the upheaval of the French Revolution brought new troubles upon the country. The coalition against the French Republic was joined by Ferdinand, the second Bourbon King of the Two Sicilies. (See FERDINAND I.) In December, 1798, the Neapolitans attempted to drive the French out of the Papal States. They were thrown back, Naples was taken (January, 1799), and the Parthenopean Republic was created. In the same year Ferdinand was reinstated with the assistance of the English fleet. In 1896 Napoleon conquered the Kingdom of Naples and placed his brother Joseph Bonaparte on the throne, Ferdinand continuing to reign in Sicily. In 1808 Joseph was succeeded by Joachim Murat (q.v.). After the fall of Murat in 1815 Ferdinand was restored in Naples. At the close of 1816 Ferdinand united the kingdoms of Naples and Sicily into the single kingdom of the Two Sicilies and changed his title from Ferdinand IV. to Ferdinand I.

In 1820 there was a military rising in the Neapolitan dominions, joined by the Carbonari (q.v.), under the leadership of General Pepe, to secure a constitutional government. The King yielded to the demand, notwithstanding his agreement with Austria to make no constitutional concessions. At the same time a revolutionary movement aiming at autonomy for the island took place in Sicily. The congress of the Great Powers at Laibach (1821) charged Austria with the restoration of Ferdinand's absolute power. The patriots made an ineffectual resistance and Ferdinand resumed his tyrannical sway under the protection of Austrian bayonets. Ferdinand died in 1825 and was succeeded by his son, Francis I. (q.v.), who in 1830 was succeeded by his son Ferdinand II. (q.v.). The change of rulers brought about no change in the despotic policy of the Government. After 1843 the republican propaganda of Mazzini took a strong hold in Southern Italy. At the beginning of 1848 Sicily rose in insurrection to secure an autonomous and constitutional government. Ferdinand II. saw himself forced to grant a representative constitution to his subjects. This did not satisfy the Sicilians. The deposition of King Ferdinand was declared, a provisional Government was organized, and the Duke of Genoa, son of the King of Sardinia, was elected King of the Sicilians (June, 1848), a dignity which he declined. In his Neapolitan dominions Ferdinand, with the aid of the reactionary elements, was enabled successfully to combat the revolutionary movement which was now sweeping through Italy. In September, 1848, his forces entered upon a campaign against the Sicilians. In May, 1849, Palermo capitulated and the revolution in the island came to an end. Ferdinand, once more the despot that he had been, wreaked a fearful vengeance upon the champions of liberty in his dominions. His atrocities were finally checked by the intervention of England. In 1859 Ferdinand II. was succeeded by his son, Francis II. The emancipation of Northern Italy (except Venetia) from the rule of Austria and the tyrants upheld by her (1859-60) was speedily followed by the liberation of the Two Sicilies from the Bourbons, accomplished through the efforts of Garibaldi, and by their incorporation in the new Kingdom of Italy (1860-61). See GARIBALDI; VICTOR EMMANUEL II.; ITALY.

BIBLIOGRAPHY. Freeman, *The History of Sicily from the Earliest Times* (Oxford, 1891); id., *The Story of Sicily* (New York, 1892); Von Schack, *Geschichte der Normannen in Sicilien* (Stuttgart, 1889); Amari, *Storia dei Musulmani di Sicilia* (Florence, 1854-72); Colletta, *Storia del reame di Napoli dal 1734 al 1825* (Capolago, 1854); Gemelli, *Storia della rivoluzione siciliana 1848-49* (Bologna, 1868).

TYA'NA, APOLLONIUS OF. See APOLLONIUS OF TYANA.

TYBEE, tī-bē′. An island at the mouth of the Savannah River, Georgia. It is historically noted as the site of the batteries erected by General Gillmore in 1861 for the reduction of Fort Pulaski, which capitulated April 11, 1862. At the north end of the island stands a lighthouse of the first order, 134 feet high, lighting the Tybee Roads, from which a channel protected by jetties leads up to Savannah.

TY'BURN. The chief place of execution in London prior to 1783, and frequently mentioned in English history and literature. It was situated near the northeast corner of Hyde Park, at the western extremity of Oxford Street, and at the point where the Edgeware and Uxbridge roads unite, almost where the Marble Arch now stands. It took its name from a small stream which ran from Hampstead to the Thames through Saint James's Park, but which has long since disappeared. The gallows was a permanent erection, resting on three posts. Wooden galleries were erected near it for the accommodation of spectators. The criminal was conveyed from Newgate (q.v.) to Tyburn, a distance of about two miles, by Holborn and the Tyburn Road, now Oxford Street. As Oxford Street and London generally spread westward, the long procession became inconvenient, and the place of execution was, in 1783, removed to the Old Bailey, or Newgate. Under a Parliamentary statute prosecutors who secured a capital conviction against a criminal were exempted from all manner of parish and ward "offices within the parish in which the felony had been committed," and obtained what was called a 'Tyburn ticket,' which was enrolled with the clerk of the peace, and sold like any other property. The privileges the tickets conferred were greatly valued, as they sold at a high price.

TYCHO BRAHE, tē′kō brä′ĕ *or* brä. See BRAHE.

TYCHO′NIUS (?-c.400). A Donatist writer. He was born in Africa, headed a party among the Donatists, and defended their position. Of his writings those of most interest are his biblical works, a commentary on the Revelation and especially his *Liber Regularum*. The latter has been edited by F. C. Burkitt, *The Book of Rules of Tychonius* (Cambridge, 1894), and has great interest as the first attempt at a system of hermeneutics.

TYCHSEN, tĭk′sen, OLAUS GERHARD (1734-1815). A German Semitic scholar. He was born at Tondern, Schleswig, studied at Halle, and taught in the orphan asylum there. In 1759-60 he traveled through Germany and Denmark as a missionary to the Jews. In 1760 he went to the newly founded University of Bützow, where he was professor of Oriental languages from 1763 till the university was closed in 1789. He then became librarian at Rostock. Tychsen is especially noted for his knowledge of Rabbinic literature and Jewish history and for his work in Arabic paleography; he also attempted to decipher the cuneiform inscriptions. He published *Bützowische Nebenstunden* (1766-69); *Physiologus Syrus* (1795); *Historia Monetæ Arabicæ* (1797); and *Tractatus de Legalibus Arabum Ponderibus ac Mensuris* (1800), the treatise of Makrizi. For his biography, consult Hartmann (Bremen, 1818-20).

TYCOON, or **TAIKUN**, tī′kōōn′ (Jap. *taikun*, great prince, from Chin. *ta*, great + *kiun*, prince). A title formerly applied to the Shogun of Japan by foreigners. It dates from the early days of Occidental intercourse with the Japanese people.

TYD′EUS (Lat., from Gk. Τυδεύς). In Greek mythology, son of Œneus and Peribœa. As a result of a murder he was forced to flee from his father's kingdom of Calydon and married Deipyle, daughter of Adrastus, King of Argos. He went with Adrastus against Thebes, where he slew Melanippus, who had wounded him. When Athena came to him with a remedy which would have made him immortal, Amphiarus brought him the head of Melanippus. Tydeus devoured a part of it, and the goddess, in disgust, abandoned him.

TYE, CHRISTOPHER (c.1497-1572). An English organist and composer of considerable note in the sixteenth century. He became a chorister, and in 1536 a gentleman of the Chapel Royal, and attained so high a reputation that he was chosen as instructor in music to Edward VI. before his accession, and probably to the other children of Henry VIII. He received the degree of Doc. Mus. from Cambridge in 1545, while probably organist of Ely Cathedral. Under Elizabeth he was organist of the Chapel Royal, and produced many services and anthems, some of which continue to be sung in England. Some of them show a marked originality and variety of treatment, especially the anthem which is considered his best work, "I Will Exalt Thee." The mass, "Euge bone," is an admirable piece of contrapuntal writing. He also translated the first half of the Acts of the Apostles into English verse, and then set it to music of generally excellent quality. He seems to have taken orders and to have held two or three parishes in the neighborhood of Cambridge.

TY′ERMAN, LUKE (1820-89). An English Wesleyan minister and author. He was born at Osmotherly, Yorkshire, England, entered the ministry in 1842, and continued to preach until 1864, when he retired and devoted himself to literary work. He published: *The Life and Times of Rev. Samuel Wesley* (1866); *The Life and Times of Rev. John Wesley* (1870); *The Oxford Methodists* (1873); *The Life of Rev. George Whitefield* (1876); *Wesley's Designated Successor; the Life, Letters, and Literary Labors of Rev. John William Fletcher* (1883).

TYLDESLEY (tĭlz′lĭ) **WITH SHAKERLEY**, shăk′ẽr-lĭ. A town in Lancashire, England, 10 miles northwest of Manchester. Its modern growth is due to its cotton manufactures and neighboring collieries. Population, in 1891, 12,891; in 1901, 14,843.

TY′LER. The county-seat of Smith County, Tex., 105 miles east by south of Dallas; on the Saint Louis Southwestern and the International and Great Northern railroads (Map: Texas, G 3). It has Tyler College, a commercial and literary institution, and Texas College (Methodist) for colored youths. Noteworthy are the city hall, the Federal court and post-office building, the Court of Criminal Appeals building, and the Saint Louis Southwestern Railroad Hospital. There are two parks, Bellevue and Lakewood. Tyler derives considerable importance from its situation in a fertile section producing large quantities of fruit, vegetables, and cotton. A box and crate factory, a fruit and vegetable cannery, a pottery, and railway shops are the leading industrial establishments. There are several wholesale houses. Under the charter of 1876 the government is vested in a mayor, chosen biennially, and a unicameral council. Tyler was settled about 1844, and was first incorporated about 1850. Population, in 1890, 6908; in 1900, 8069.

TYLER, Bennet (1783-1858). A Congregational minister. He was born at Middlebury, Conn., graduated at Yale College 1804, and was ordained pastor of the Congregational Church, South Britain, Conn., 1808; he was president of Dartmouth College, 1822-28; and pastor of Second Church, Portland, Me., 1828-33. In the following year he became president and professor of theology in a theological seminary at East Windsor (removed to Hartford, 1865). This position he held until his death. He published: *History of the New Haven Theology* (1837); *Memoir of Rev. Asahel Nettleton* (1844); *Treatise on the Sufferings of Christ* (1845); *A Treatise on New England Revivals* (1846); *Letters to Dr. H. Bushnell on Christian Nurture* (1847-48, 2 series); *Lectures on Theology* (posthumous, with memoirs by his son-in-law, Rev. Dr. Nahum Eale, Boston, 1859).

TYLER, Daniel (1799-1882). An American engineer and soldier, born at Brooklyn, Conn. He graduated in 1819 at the United States Military Academy, and in 1824-26 served at the Fortress Monroe School of Artillery Practice. In 1828-29 he was in France, studying artillery methods, in 1830-34 was on ordnance duty, and in the latter year resigned. He was contracting engineer and president of several railways until the Civil War, when he became colonel of the First Connecticut Volunteers, and was soon afterwards commissioned brigadier-general. Having been mustered out, he was in 1862 reappointed with rank of brigadier-general, and participated in the Mississippi campaign and the siege of Corinth. In 1863 he commanded the Union forces at Harper's Ferry and Maryland Heights.

TYLER, John (1790-1862). The tenth President of the United States. He was born at Greenway, in Charles City County, Virginia, March 29, 1790. He was the son of Judge John Tyler, who was Speaker of the Virginia House of Delegates, Governor of Virginia, and at different times a judge of the State and Federal courts. The son graduated at William and Mary College in 1807; was admitted to the bar in 1809; and became a member of the Legislature in 1811, where he acted with the Republicans and supported the war with Great Britain. He was continuously elected to the Legislature five times in succession until 1816, when he was chosen to Congress. In the House of Representatives, during the Fourteenth and Fifteenth Congresses, he acted with the States-Rights Republicans, condemned General Jackson's course in Florida, and opposed the United States Bank and the Missouri Compromise. In 1825 he was elected Governor of Virginia by the Legislature, and was unanimously reëlected the following year. At the close of his second term as Governor he was elected over John Randolph to the United States Senate, in which he opposed the tariff measures of 1828 and 1832, opposed nullification, but condemned Jackson's nullification proclamation, although he supported Jackson for the Presidency in 1832 and stood alone among the Senators in voting against the 'Force Bill' of 1833. He was reëlected to the Senate for a second term, and in 1834 made a report censuring President Jackson for removing the deposits from the United States Bank, and voted for Clay's resolution of censure against the President. Having subsequently been instructed by the Legislature of Virginia to vote for the expunging of the resolution of censure, he refused to obey the instructions, and in February, 1836, resigned his seat and retired to private life. Tyler was one of the leading members of the new Whig Party, and was one of the unsuccessful candidates for the Vice-Presidency in 1836. In 1840 he was elected Vice-President on the Whig ticket with General W. H. Harrison (q.v.). President Harrison died April 4, 1841, one month after his inauguration, and was succeeded by Tyler, who completely broke with the party that had elected him. He vetoed the bill to recharter the Bank of the United States, and when it was modified partly in accordance with his suggestions and repassed he vetoed it again. The bill to revise the tariff met a similar fate. Thereupon, on September 11, 1841, all the members of the Cabinet except Webster, who was then engaged in negotiations with Great Britain concerning the boundary between the United States and Canada, resigned, and a year later Webster followed. Shortly thereafter some of the leading Whigs issued a public address declaring that "all political connection with them and John Tyler was at an end from that day henceforth." The chief events of Tyler's administration were the conclusion of the Webster-Ashburton Treaty (q.v.) with Great Britain and the annexation of Texas. At the close of his term Tyler retired to his estate in Charles City County, Va., where he remained until 1861, when he was called out to preside over the Peace Convention at Washington. Failing in his efforts at compromise, he gave his adhesion to the Confederate cause, voted for secession in the Virginia convention, served in the Confederate Provisional Congress, and was elected to the Confederate House of Representatives, but died at Richmond, January 18, 1862, before he could take his seat. For his biography and that of his father, consult: *The Letters and Times of the Tylers* (Richmond, 1884-85), written by his son, Lyon G. Tyler. For a more detailed account of the events of his administration, see the section on *History* in the article United States.

TYLER, Lyon Gardiner (1853—). An American educator, son of President Tyler, born at Sherwood Forest, Va. He graduated in 1875 at the University of Virginia, studied law, and from 1877 to 1879 was professor of belles-lettres at William and Mary College. In 1879-82 he was principal of Memphis Institute, in 1882-88 practiced law at Richmond, Va., and in 1887 was a member of the Virginia House of Delegates. In 1888 he became president of William and Mary College. His publications include *The Letters and Times of the Tylers* (1884-85) and *Parties and Patronage in the United States* (1890).

TYLER, Moses Coit (1835-1900). An American literary historian and educator, born at Griswold, Conn. His parents removed to Michigan, where he began his education. He graduated at Yale in 1857 and, after studying theology there and at Andover, took charge of Congregational churches at Owego and then at Poughkeepsie, N. Y. Broken down by over-study, he resigned the latter charge in 1862 and went to England, where he spent four years recuperating, studying, lecturing, and writing letters to the New York *Independent* and the New York *Nation*. In 1867 he accepted the chair of English at the University of Michigan, and in 1881 he was called to the chair of American history at Cornell, a position which he held until his death. In 1881 he was ordained deacon in the Protestant Episcopal Church, and was advanced to the priesthood in 1883. Meanwhile he had published his *History of American Literature During the Colonial Time* (2 vols., 1878) and had won a wide reputation for scholarship. This history, which was continued in the two volumes entitled *A Literary History of the American Revolution* (1897) and in the essays entitled *Three Men of Letters* (Bishop Berkeley, President Dwight, and Joel Barlow, 1895), constitutes Professor Tyler's chief claim to remembrance. It hardly carries the story of our literature beyond the year 1783, but within its limits is characterized by such accuracy and breadth of scholarship, such genial sympathy and attractiveness of style, that it is not likely to be superseded, and fully entitles its author to rank with the great literary historians of the world. Its chief defects are diffuseness and a failure to apply standards rigorously. Besides this history, Tyler's most important work is a biography of Patrick Henry in the American Statesmen series (1887). He also published *The Brawnville Papers* (1869), devoted to the claims of physical culture; a revision of H. Morley's *Manual of English Literature* (1879); *Memorial of E. K. Apgar* (privately printed, 1886); and *Glimpses of England* (1898), a collection of his letters from England mentioned above. Consult a paper by W. P. Trent in the *Forum* for August, 1901, and one by G. L. Burr in *Report of the American Historical Association* for 1901 (vol. i.).

TYLER, Ransom Hebbard (1813-81). An American author, born in Leyden, Mass. He studied law, and was admitted to the New York bar. He was elected to numerous local offices, including those of district attorney and county judge for Oswego County. An extensive traveler, he was also editor of the Oswego *Gazette*, and contributed widely to periodicals. He published *The Bible and Social Reform* (1863); *American Ecclesiastical Law* (1866); *On Usury, Pawns, and Loans* (1873), and several other works.

TYLER, Royall (1757-1826). An American jurist and author, born in Boston. He graduated at Harvard College in 1776, studied law under John Adams, and was for a time aide to General Benjamin Lincoln, serving in the Revolution and in Shays's Rebellion in 1786. In 1790 he removed to Vermont, became a judge of the Supreme Court in 1794, and was Chief Justice from 1800 to 1806. His chief legal work was *Reports of Cases in the Supreme Court of Vermont* (1809-10). He wrote several clever and successful plays, of which one, *The Contrast*, a comedy partly in Yankee dialect, presented in New York in 1787, was the first American comedy produced by a regular professional dramatic company. Other plays were *May Day, or New York in an Uproar* (1787), and *The Georgia Spec., or Land in the Moon* (1797). He also contributed light, witty verse to periodicals and wrote a picaresque story, *The Algerine Captive, or the Life and Adventures of Dr. Updike Underhill, Six Years a Prisoner Among the Algerines* (1797); *Moral Tales for American Youths* (1800); and *The Yankey in London* (1809). Tyler's *Contrast* was published in 1790 and reissued in 1887 by the Dunlap Society, with an introduction by T. J. McKee. Some of his work may be found in *The Spirit of the Farmer's Museum* (1801), for he helped Joseph Dennie (q.v.) to make *The Farmer's Museum* a success, and also in Dennie's late newspaper, *The Portfolio*, of which Tyler's sane literary criticism was an important feature.

TYLER, Wat (?-1381). The principal leader of the English social revolt of 1381. Owing to the fact that he was captain of the Kentish insurgents, he is generally supposed to have been a Kentishman; but Kentish jury indictments recently published, and the best contemporary evidence, show that he was from Colchester in Essex. He should not be confounded with his colleague, Jack Straw, captain of Essex. The usual supposition drawn from his name, that he was a tiler by trade, is by no means certain, since a surname in the fourteenth century does not necessarily indicate the bearer's trade. Nothing is known of his life previous to the revolt. The usual unfavorable estimates of his character are based upon the hostile and unreliable testimony of Walsingham and Froissart. Even hostile sources are agreed as to his ability. His part in the organization of the revolt was second only to that of John Ball, and he was certainly the chief factor in conducting it. The peasants' levies were summoned in his name, and important questions were submitted to his personal decision. On special occasions he acted as spokesman of the insurgents, presenting their demand to the King. We are told on good authority that he was very eloquent. The extent of his importance as a leader is shown by the entire collapse of the revolt after his murder at Smithfield. For his part of this movement, resulting in his death, see Tyler's Rebellion.

TYLER'S REBELLION. The name usually applied to the English social revolt in 1381, from Wat Tyler, its chief leader. It had been prepared for years by the teaching of a priest, John Ball (q.v.), in Southern and Eastern England, and from his home at Colchester it was silently organized throughout Essex, and thence in the adjoining counties, especially Middlesex, Sussex, and Kent. The brutal collection of an oppressive poll-tax greatly incensed the people, and gave occasion for the outbreak in Essex in the early part of June, 1381. The country was soon aflame, and a division under Wat Tyler and Jack Straw crossed the Thames at Erith. After capturing the Castle of Dartford, where Tyler was chosen leader, and securing the allegiance of the Mayor and Council of Canterbury, they marched, in irresistible force, on London. On June 12 they camped at Blackheath, a southeastern suburb, while the Essex men, under Jack Straw, gathered at Mile End. From all sides bands of insurgents, from the most distant counties, marched on London, Corpus Christi (June 13) being the day of reckoning chosen.

Disappointed in a promised conference at Blackheath with the young Richard II., whom the Council would not permit to land from his barge in the Thames, the insurgents on June 13 marched on London. The London populace and the powerful Fishmongers' Company sided with them, and both the southern and northern armies were admitted into the city. The former straightway invested the Tower of London, in which the King, his Council, and many of the nobility had taken refuge. In vain did Richard try to calm them from a turret; yielding to their threats, the Council agreed to the King's meeting them on the following morning at Mile End.

The traditional account of this conference, based on Froissart, represents the boy King by his cool courage calming the raging insurgents and inducing them to disperse. In reality it was a conference between the timid lad and the leaders, with Tyler as spokesman, in presence of the entire rebel army. The King listened to Tyler's harangues, graciously granted all their demands, and then retired to the Tower Royal, another London fortress. The insurgents' demands included the abolition of serfdom, a maximum rent of fourpence the acre for lands thus freed, the right to buy and sell free of toll all over England, and the abolition of the Statutes of Laborers, by which wages had been fixed in the interests of the landlords and master craftsmen. The King also agreed to the execution of his ministers by the insurgents, and promised in future to choose his councilors from among them.

By virtue of this grant, the commons marched straightway to the Tower, seized and beheaded such of the ministers as they could secure—the Archbishop of Canterbury, who was Chancellor, and the Treasurer, Sir Robert Hales, besides a few others, among whom were four collectors of the poll-tax. Meanwhile a large number of the insurgents returned home, satisfied with the abolition of villeinage. But the most formidable division, under Tyler, Straw, and Ball, remained, demanding further economic concessions, and above all the reformation of the Church, in accordance with Ball's ideals. The King agreed to meet them at Smithfield at vespers of June 15. Here, too, the traditional account has thrown unnecessary glamor about the heroism of Walworthe, Mayor of London, and the boy King. In reality, Tyler was lured out of sight of his men, and after his demands had been granted, a pretext was found to arrest him, in resisting which he was dispatched by Walworthe and others of the royal retinue. Their demands having been granted, the rebels were induced to go to Saint John's Field, as they supposed, at Tyler's command. When they learned the truth, and saw the royal forces approaching, they were glad to disperse, retaining the charters of freedom granted at Mile End.

The demands of the insurgents at Smithfield include two legal requirements directed especially against the Statutes of Laborers, one against serfdom, and a fourth demanding free use of woods, hunting and fishing to all tenants of manors. Their demands for the reformation of the Church differ from others of a later period in that the confiscation of church property accrues to the benefit of the common people, instead of King or nobility, by enfranchising the tenants of clerical domains and decreasing clerical taxes. The reforms were the most democratic ever demanded.

Though the political and economic aspirations of the peasantry formed the backbone of the revolt of 1381, there were other important factors. The lower classes of the towns sympathized with the insurgents. In some cases the city governments, like Canterbury and Bridgewater in the south and York, Scarborough, and Beverley in the north, were implicated. A very important factor was a general uprising against the monasteries, both of tenants and especially of mesne towns. At Saint Albans, both townsmen and peasants extorted charters of liberties. There were similar movements at Reading, Dunstable, and many other smaller foundations; at Cambridge the movement took the form of an uprising against the university. In Sussex it centred in a fierce revolt against Abbey Saint Edmunds, the prior of which was beheaded. John Wrawe, the captain of the county, was a priest, as were several others of the leaders. In Norfolk the plundering was especially severe; under the leadership of Geoffrey Lister and Sir Roger Bacon, ambassadors with a large sum of money were sent to the King to obtain the liberties desired. All of these local outbreaks were more or less connected with the central movement. There was rather less plundering than might have been expected, and violence was usually directed against persons connected with the Government or local oppressions, and especially those known as adherents of John of Gaunt. After the rebels had retired, the remnants of the revolt were stamped out with great severity; the liberties granted were everywhere revoked, and the reaction was far bloodier than the revolt. The effect of the movement was to abolish for the time the poll-taxes, to do away practically with the Statute of Laborers, and to hasten the general tendency toward the abolition of villeinage.

Consult Kriehn, in *American Historical Review*, vol. vii. (New York, 1902); also Powell, *The Rising in East Anglia in 1381* (Cambridge, 1896); Réville, *Soulèvement des travailleurs d'Angleterre en 1381* (Paris, 1898); Trevelyan, *England in the Age of Wycliffe* (London, 1899); id., *The Peasant Rising and the Lollards* (ib., 1899).

TYLOP'ODA (Neo-Lat. nom. pl., from Gk. *τύλος*, *tylos*, knob, knot, callus + *πούς*, *pous*, foot). A section of the Ruminantia, which embraces the Camelidæ, distinguished by the padded character of the soles of the feet. See Camelidæ.

TY'LOR, Edward Burnett (1832—). An English anthropologist, born in London. He was educated at the Grove House School, Tottenham. He entered his father's brass foundry in 1848, but his health forced him to abandon the work. After a year's travel in the United States, he went to Mexico in 1856 with Henry Christy and in 1859 published the results of his observation in a volume entitled *Anahuac, or Mexico and the Mexicans*, which shows great accuracy of description. In 1865 his *Researches into the Early History of Mankind* appeared; in 1871 he published his *Primitive Culture*, in 1881 his *Anthropology*, and in 1900 *The Natural History of Religion.* These works immediately became popular and have exerted a profound influence on the development of anthropological science. Tylor's most important scientific contribution is his treatment and development of the doctrine of animism as the fundamental and universal factor in primitive religions. (See Religion, Comparative.) In 1896 he was made first professor of anthropology at Oxford.

TYLOSIS (from Gk. τύλος, *tylos*, knob, knot, callus). A protrusion of a living cell through a pit in a large pitted vessel, due to the pressure in the cell. Often the nucleus and some of the protoplasm passes through the pit into the tylosis, and in this case cell division may take place until the cavity of the vessel is entirely filled with the growing tissue. Tyloses are found in both monocotyledons and dicotyledons. Sections of the stem of the Virginia creeper (*Ampelopsis quinquefolia*) show tyloses in which cell division has taken place until the cavities of the vessels are nearly closed.

TYMPANITES, tĭm'pan-ī'tēz. A disease of horses. See Bloat.

TYMPANUM (Lat., from Gk. τύμπανον, drum). In anatomy, the middle ear. (See Ear.) In architecture, the flat space left within the sloping and horizontal cornices of the pediment of classical architecture, usually filled with sculpture; also, the space between the arch and lintel of doorways in Gothic architecture, which is frequently enriched with sculpture.

TY'NAN, Katharine. An English novelist. See Hinkson, Mrs. Katharine.

TYNDALE, tĭn'dal, William (?-1536). An English translator of the Bible. He was born on the borders of Wales, between 1490 and 1495, and was educated at Oxford and Cambridge. After leaving Cambridge (about 1522) he became tutor and chaplain in the home of Sir John Walsh, a knight of Gloucestershire. He preached frequently and, his opinions differing from those of the clergy of the neighborhood, he became involved in religious dispute, and an accusation was made against him before William of Malvern, chancellor of the diocese, who censured him for his boldness and indiscretion. As a result of his experience, Tyndale became determined to translate the New Testament into English. He went to London in 1523, but, failing to obtain help, he retired to Germany the following year. The New Testament was printed at Worms in 1525 and carried to England, and, though denounced by the Government, several reprints were produced within the next few years. Tyndale remained on the Continent writing tracts in advocacy of the reformed doctrines. His chief original work, *The Obedience of a Christian Man and How Christian Rulers Ought to Govern,* appeared in 1528. In 1530 he published a translation of the Pentateuch, and in 1531 one of the Prophet Jonah. He engaged in a controversy with Sir Thomas More (q.v.) concerning the supreme authority of the Church on the Scripture. During this period Tyndale associated with Luther, John Frith, Patrick Hamilton, John Rogers (qq. v.), and other leading reformers. He adopted the Zwinglian doctrine of the Lord's Supper, and separated himself from the other English reformers by opposing the divorce of Henry VIII. from Catharine of Aragon. He was the subject of much annoyance from the authorities and changed his abode from time to time. In 1535 he was treacherously arrested at Antwerp, and, after a confinement of sixteen months in the Castle of Vilvorde, near Brussels, the State prison of the Low Countries, he was publicly strangled and burned as a heretic August 6, 1536. Tyndale was a man of both learning and talent; his translations were made directly from the Hebrew and Greek. He had a good style and was devoted to his work. His New Testament has been frequently reprinted (in facsimile by Francis Fry, London, 1862); his Pentateuch was edited by Mombert (New York, 1884); and his miscellaneous writings were published by the Parker Society (London, 1848-50). The best biography is by Demaus (London, 1871; 2d ed. 1886).

TYNDALL, tĭn'dal, John (1820-93). An English physicist, born at Leighlin Bridge, County Carlow, Ireland. He found employment at first in one of the subordinate grades of the Ordnance Survey, and later as a railroad engineer. He was appointed teacher of mathematics and surveying at Queenwood College, Stockbridge, in 1847. He then went to Marburg, where he studied for two years, returning to Queenwood in 1851. In January, 1853, Tyndall communicated his first paper to the Royal Society, *On Molecular Influences—Transmission of Heat Through Organic Structures.* In the following month a lecture *On the Influence of Material Aggregation upon the Manifestations of Force,* before the Royal Institution, widely extended his fame, and inaugurated his reputation as a brilliant lecturer. A few months later he was appointed professor of natural philosophy in the Royal Institution, thus becoming a colleague of Faraday, succeeding as director on the latter's death in 1867. Tyndall early undertook researches on diamagnetism at Marburg in conjunction with Knoblauch, which resulted in a publication entitled *On the Magneto-optic Properties of Crystals and the Relation of Magnetism and Diamagnetism to Molecular Arrangement.* These and later researches were published under the title of *Researches on Diamagnetism and Magno-crystallic Action, Including the Question of Diamagnetic Polarity* (1870). Tyndall spent much time in the Alps, where he combined mountain-climbing with scientific research, making numerous careful observations on the great Swiss glaciers. These were published in popular form and in scientific contributions to the *Philosophical Transactions.* In connection with his study of the glaciers, Tyndall became interested in atmospheric phenomena, particularly the study of vapors. This led to researches on radiant heat and its transmission, radiation, and absorption by vapors and gases. These investigations involved a controversy with Magnus, but Tyndall was able to demonstrate the correctness of his views. These researches were later collected and published under the title *Contributions to Molecular Physics in the Domain of Radiant Heat* (1872). In his study of radiant energy Tyndall analyzed various kinds of light in order to determine the proportion of luminous and non-luminous rays and their effect on various substances. He also discovered that in 'optically pure air,' that is, air free from dust or other particles, a luminous beam is invisible. These discoveries led to improved methods of sterilization, which are described in his *Essays on Floating Matter of the Air in Relation to Putrefaction and Infection.*

The British Government availed itself of Tyndall's scientific ability and he succeeded Faraday as a scientific adviser to Trinity House (in charge of the lighthouse service) and the Board of Trade, in which capacity he carried on a number of scientific experiments with direct practical ends. Tyndall also achieved a reputation as a lecturer and did much valuable work in the popularizing of science. Few scientific lecturers have been able to present the principles and facts of physics to the general public so successfully as Tyndall. He visited the United States in 1872-73, on a lecture tour, and a few years after he gave the proceeds to forward the cause of original research in the United States. He wrote many popular treatises on scientific subjects, which have been translated into foreign languages. Among his works are: *Heat Considered as a Mode of Motion* (1863 and subsequent editions); *On Sound* (1867 and subsequent editions); *Fragments of Science for Unscientific People* (1871 and subsequent editions); *Six Lectures on Light Delivered in America in 1872-3* (1873 and later editions); *New Fragments* (1892 and 1897); *Notes on Light* (1870); *Notes on Electrical Phenomena and Theories* (1870). His works on the glaciers and the Alps include *The Glaciers of the Alps* (1860 and 1896); *Mountaineering in 1861* (1862); and *Hours of Exercise in the Alps* (1871 and later editions).

TYNDAREUS, tĭn-dā′rē-ŭs (Lat., from Gk. Τυνδάρευς). A King of Sparta. Having been driven out by his half-brother, Hippocoon, he fled to Ætolia and became an ally of Thestius, whose daughter Leda he married. Hercules restored him to Sparta. Leda bore him Castor and Clytemnestra, and at the same time by Zeus became the mother of Pollux and Helena. After the death of Castor and Pollux and their reception among the gods, Tyndareus surrendered the kingship of Sparta to Menelaus.

TYNE, tīn. A river of Northern England (Map: England, E 2). It is formed by the North and the South Tyne, which rise, respectively, in the Cheviot and the Pennine Hills. It flows eastward, partly on the boundary between Northumberland and Durham, till it empties into the North Sea at Tynemouth. It passes through one of the principal coal-mining and manufacturing regions of England, and the cities of Newcastle, Gateshead, and South Shields lie on its banks. Length, 80 miles; navigable to Blaydon, about 18 miles. Consult: Guthrie, *The River Tyne* (Newcastle-upon-Tyne, 1880); Palmer, *The Tyne and Its Tributaries* (London, 1881).

TYNEMOUTH, tĭn′mŭth *or* tīn′-. A market town and seaport, the chief watering place of Northumberland, England, at the mouth of the Tyne, 8 miles east of Newcastle (Map: England, E 1). It includes the townships of North Shields, Chirton, Preston, and Cullercoats. Shipbuilding is carried on and there are rope and sail works, besides important fisheries. The sands, about a mile in length, are overlooked by picturesque cliffs. Noteworthy are the gateway of the old castle, the fine ruins of a priory and lady chapel, the master mariners' asylum, the aquarium, and assembly rooms. The municipal borough buildings are in North Shields. Incorporated in 1849, the town owns and operates the water and electric lighting works. Tynemouth was a Saxon fortress. Population, in 1891, 46,588; in 1901, 51,514. Consult: Gibson, *Monastery of Tynemouth* (London, 1846); Adamson, "Tynemouth Priory and Castle," in *Archæologia Ælina*, vol. xxiii. (London, 1901).

TYNG, tĭng, STEPHEN HIGGINSON (1800-85). A Protestant Episcopal clergyman. He was born at Newburyport, Mass.; graduated at Harvard college, 1817; engaged in mercantile pursuits for two years; studied theology, and was ordained in 1821; preached at Georgetown, D. C., 1821-23; at Queen Anne's Parish, Prince George Co., Md., 1823-29; was rector of Saint Paul's Church, Philadelphia, 1829; of the Church of the Epiphany, Philadelphia, 1833; and of Saint George's Church, New York, 1845, which charge he resigned in 1879. Dr. Tyng was a pronounced evangelical and low churchman and a leading opponent of ritualism. He was widely noted for his fervid eloquence as a preacher, and he zealously advocated total abstinence and other reforms. He published, aside from discourses, Memoirs of Rev. Gregory T. Bedell (1835), and those of Dudley Atkins Tyng (1866); *Recollections of England* (1847); *Forty Years' Experience in Sunday-Schools* (1860); *The Prayer Book Illustrated by Scriptures* (8 vols., 1863-67); and *The Office and Duty of the Christian Pastor* (1874). He was editor of *The Episcopal Recorder*, *The Theological Repository*, and *The Protestant Churchman*. Consult his *Life* by his son, C. R. Tyng (New York, 1891).

TYPE (Lat. *typus*, from Gk. τύπος, type, figure, impress, blow, from τύπτειν, *typtein*, to strike; probably connected with στυπάζειν, *stypazein*, to push, Skt. *tup*, *sthump*, to destroy, Lat. *stuprum*, violation). In zoölogy: (1) The name applied by De Blainville to the four branches of Cuvier. These 'types' were founded on what were then considered as four fundamental 'plans' of organization. (See CLASSIFICATION OF ANIMALS.) Cuvier and his successors, notably Von Bael and L. Agassiz, taught that these types existed, as it were, side by side, the Vertebrata the highest, but with no genetic connection, and that each type was characterized by a distinct plan of structure—a view now superseded by that of the doctrine of descent. See EVOLUTION; PHYLOGENY.

(2) The 'type' or 'typical species' of a genus is the one first described, or regarded as the most typical, and about which the other species were clustered. A 'type specimen' is that individual, or the several individuals, which served as the basis for the description of a new species. The careful preservation of an author's type specimen is all-important in systematic zoölogy and botany, as it is the ultimate source of appeal in unraveling complicated cases of synonymy.

TYPE. In theology, an image or representation of some object which is called the antitype (q.v.). It is applied chiefly, although not exclusively, to those prophetic prefigurings of the persons and things of the new dispensation which are found in the ritual, and even in the history of the Old Testament. Saint Paul and other sacred writers speak of the ancient types of things to come. Of the types of the Old Testament, many are directly pointed out as such in their very institution; many also are distinctly applied in the

New Testament. There is a large class, however, which more properly fall under the mystical sense of Scripture, and which are called indirect, that is to say, 'adaptive' or 'applied' types.

TYPE FOUNDING. The art of founding or casting printers' types. (See PRINTING.) In the early times printers made their own type, but about the middle of the sixteenth century the necessity arose for a division of labor and type founding became a business distinct from printing. The art was first developed in France and from that country spread to Italy, Germany, England, and the United States. The first type cast in America was made by Christopher Saur, at Germantown, Pa., about 1735. In 1796 the Scotch type founders Binny and Ronaldson established a type foundry in Philadelphia, Pa., which after many struggles succeeded. Between 1735 and 1796 several persons, among whom was Benjamin Franklin, attempted to found type, but they all failed to make a business success of their attempts. In 1810 Elihu White established a successful type-founding business in New York, and in 1813 the firm of D. & G. Bruce began business as type founders in the same city. These early type founders all cast their type by hand, after much the same methods, probably, as had been practiced since metal types were first used. Indeed, it was well on toward the middle of the nineteenth century before type was successfully founded by machine to any considerable extent.

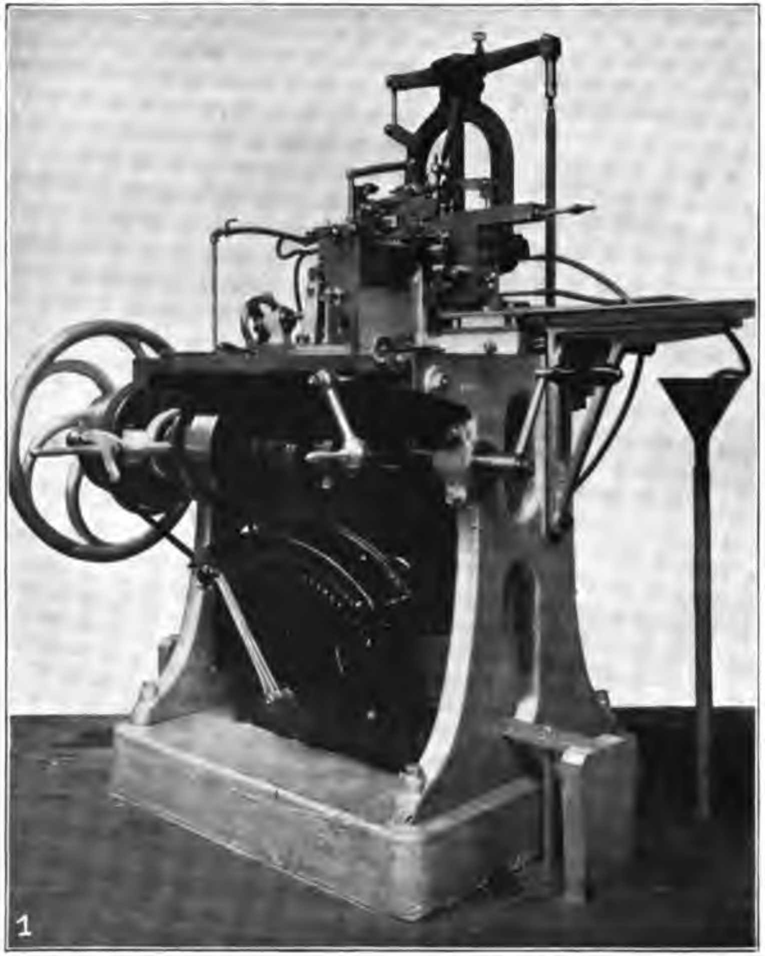
HAND FOUNDING. The first step in the process of type founding by hand is the cutting of a punch or die resembling the required letter. The punch is of hardened steel, with the figure of the letter cut, the reverse way, upon its point. On this die being finished, it is struck into a piece of copper about an inch and a quarter long, one-eighth of an inch deep, and of a width proportionate to the size of the type to be cast. This copper, being so impressed with the representation of the letter, requires to be adjusted to the mold, so that the 'face' or impression of the punch (in the copper) may be brought into such relation with the metal which forms the 'body' or stalk of the type, that when the types are 'set up' they may stand at the proper distance from each other, and be in 'line' or range, and also square to the page; this work is termed 'justifying,' and the copper is now a 'matrix.' The matrix is now fixed into a small instrument or frame called the mold, which is composed of two parts. The external surface is of wood, the internal of steel. At the top is a shelving orifice, into which the metal is poured. The space within is of the size of the required body of the letter, and is made exactly true. The melted metal, being poured into this space, sinks down to the bottom in the matrix, and, instantly cooling, the mold is opened, and the type is cast out by the workman. This process of casting types is executed with great celerity. Of course, every separate letter in the alphabet, every figure, point, or mark, must have its own punch and matrix. After being cast the types have to be dressed, and this work is performed by hand. It consists first in removing the projection or 'jet' of superfluous metal that clings to the end which is toward the top of the mold while the type is being cast; second, in rubbing smooth the sides of the types on grit-stones; and, finally in cutting a groove in the foot of each type and examining the type with a magnifying glass to discover imperfections. Considering the nature of the operation, type casting by hand is performed, by an expert, with remarkable rapidity, about 400 types per hour being produced ready for the finishing process.

MACHINE FOUNDING. Various attempts were made during the early part of the nineteenth century to cast types by machinery. The first successful machine for this purpose was devised by David Bruce, Jr., of New York, and was patented in 1838. As subsequently improved, this machine was extensively used in American type foundries and was introduced into Europe. Briefly described, the Bruce type-casting machine consists, first, of a small melting-pot, which contains the molten metal, and is placed over a small furnace. In the interior of the pot is arranged a forcing-pump and valve for admitting the metal under the piston, and also for preventing the return of the metal into the mass in the pot when the piston is depressed, and thus securing the full force exerted upon the piston being transmitted to the molten metal under the piston, and forcing it through a narrow channel leading from the bottom of the chamber in which the piston works to the outside of the pot, where a nipple is inserted, with a small hole through it, communicating with this narrow channel. Against this nipple the mold in which the type is formed is pressed at the moment at which the piston descends, and so receives the molten metal that forms the type.

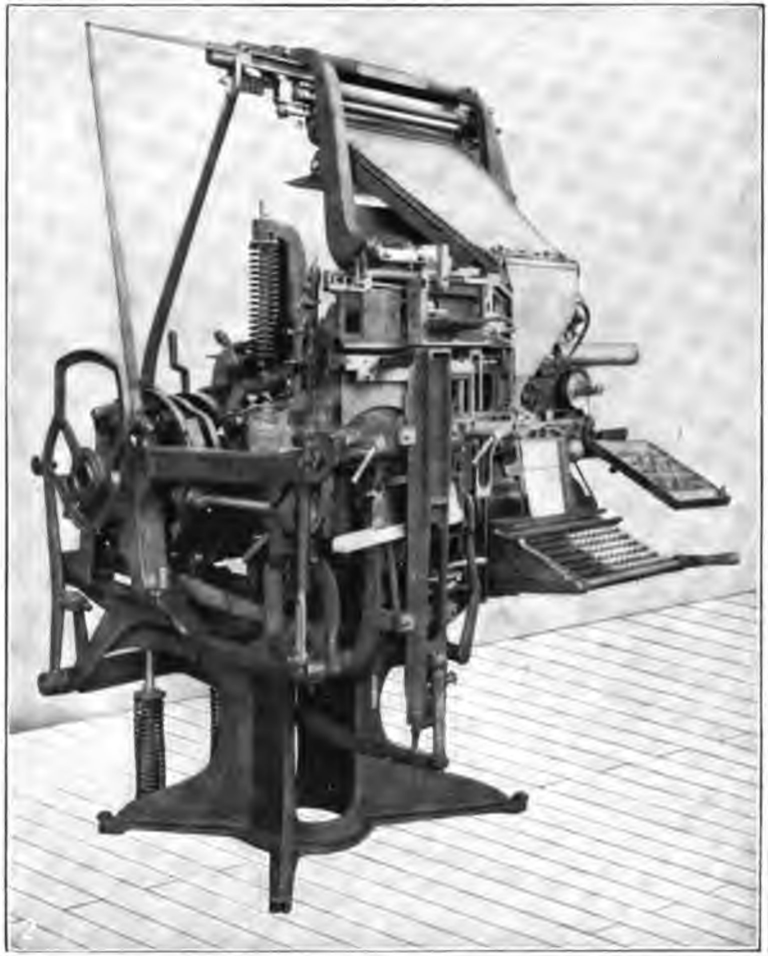
The second part of the machine is that which carries the mold, and to which the mold is firmly bolted. The mold is similar to the old hand-mold, but modified to suit the machine; it is much stronger; the 'jets' are shorter, and the orifice by which the metal enters is smaller, so that it may be brought exactly coincident with the small hole in the nipple in front of the pot. The mold—as the old hand-mold—is made in halves; one of the halves is firmly bolted to an arm which, by cams and levers, is made to oscillate, and carry the mold to and from the nipple in front of and above the pot; the other half of the mold is bolted to another arm, which, by a peculiarly formed hinge, is attached to the first arm, so that the two halves of the mold may be made to open and shut upon each other like the lid of a snuff-box; and so both sides of the mold oscillate together to and from the nipple in the pot from which they receive the molten metal. The operation of the machine is as follows: The piston being raised in the chamber of the pump, and the chamber being supplied with metal through the valve, the mold is brought against the nipple; the valve closes to prevent the metal being forced back into the pot; the piston descends, and forces the metal through the narrow channel into the mold; the mold then recedes from the nipple, and in receding the two halves separate from each other and eject the type; the mold again approaches the nipple, and in approaching the two halves close together, and are ready for another operation. A blast of cold air is directed upon each mold to keep it cool.

The types produced by the Bruce machine as built previous to 1868 had to be dressed by hand, but in that year Mr. Bruce invented an apparatus for dressing the type mechanically which could be applied to his casting machine. Bruce's im-

TYPE-CASTING AND TYPE-SETTING MACHINES



1. AUTOMATIC TYPE-CASTING MACHINE OF AMERICAN TYPE FOUNDERS COMPANY.



2. MERGENTHALER LINOTYPE MACHINE.

proved machine was followed by one designed by Henry Barth, of Cincinnati, O., in 1888. This machine casts the types, finishes them, and produces them set up in lines ready for inspection. The output of the most recent type-casting machines varies from 100 to 140 types per minute, according to the size of the letter. In conclusion, mention should be made of the type punch cutting machine, invented by L. B. Benton, which operates on the principle of the pantograph and produces from one pattern letters of any size desired.

For the history of English type founding, consult Reed, *History of the Old English Letter Founders* (London, 1887), and De Vinne, *Historic Printing Types* (New York, 1886). See TYPESETTING MACHINES.

TYPES, THEORY OF. See CHEMISTRY.

TYPESETTING MACHINES. Machines devised to set or compose printers' types automatically and mechanically. In hand composition the types are picked one at a time from a wooden case and then set one after another in the proper order to form the words which it is desired to print. After the set types have been printed from, they are distributed, i.e. returned to their proper compartments in the case. (See PRINTING.) The processes of composition and distribution by hand are tedious and expensive, and from quite early times efforts have been made to devise a machine which would perform these tasks more speedily and economically. Until within recent years, however, these attempts were not commercially successful. Perhaps the first serious attempt to design a machine to do away with hand composition of types was made by Dr. William Church, whose device was patented in England in 1822. His machine was designed to cast types and leave them in reservoirs, and they were set from these reservoirs by pressing keys arranged much like the keys of a piano. After use the types were remelted, the inventor in this way getting around the problem of distribution. Evidently Church was a man ahead of his times, for it was not until a score of years had elapsed that the issuing of patents for typesetting machines began to be frequent. In 1840 James H. Young, of England, completed a machine, which is said to have set types at the rate of 13,000 per hour, but the types had to be arranged in lines, distributed, and, presumably, placed in the magazines by hand, which required three persons besides the machine operator. The first distributing machine patented in America was invented by Frederick Rosenberg, in 1843, and the first English patent on a distributor was taken out by Etienne Robert Gaudens, in 1840. After this among prominent American inventors follow the names of Mitchell, Alden, Felt, Brown, Westcott, Kastenbein, Paige, Richards, Burr, and in recent years Thorne, MacMillan, and Mergenthaler. Among the prominent foreign inventors who achieved more or less success were Hattersley, Mackie, and Fraser, in England; Sörensen, of Denmark; Fischer and Von Langen, of Germany; and Delcambre, of France. At present only the Thorne, MacMillan, Mergenthaler, and Lanston machines are much used, but the commercial success reached by some of the earlier machines was quite remarkable. The Alden machine was at one time used in the New York *Tribune* office. Ten of the Mitchell machines, invented in 1853, are said to have been used at one time in a single office. In 1872 the London *Times* began to use the Kastenbein machines, and finally set the whole paper by them. In 1880 the Burr machine was tried in the New York *Tribune* office, and three of these machines were in use there for some years. In 1884 the Fischer and Von Langen machine was used in the office of the Cologne *Gazette*. All these successes, however, have been so far outdone by the Thorne, MacMillan, Mergenthaler, and Lanston machines that only these four need be mentioned further.

The Thorne machine, a combined setting and distributing machine, consists of an upright cylinder with vertical channels around a periphery, each channel holding a line or column of types, one channel holding *a*'s, another *b*'s, and so on. The lower half of the cylinder is stationary, and its channels contain the distributed types. The upper half of the cylinder turns with a step by step motion, and its channels contain the lines of type to be distributed. The motion of the upper cylinder is such as to bring its channels opposite those of the lower, when an instant's pause occurs, permitting any type which is opposite a channel in the lower cylinder, whose projections correspond to its own nicks, to drop down. Then the upper cylinder is rotated one step, bringing the channels again in coincidence. The type is set from the channels in the lower cylinder, the lowest type being pressed out radially when the operator depresses the key which governs it. A rapidly revolving plate whirls the type around and delivers it to an endless belt, which carries it to a setting-up mechanism. Here the type is turned upright and added to the continuous line of types, which is slowly pushed along, as type after type is added, toward the justifier, which divides it into lines of column or page length. The machine described is an excellent example of combined setting and distributing machine. In the MacMillan machine the setting and the distributing are done by separate machines. The magazines of the setting machine are removable, being exchanged for full ones as fast as they become empty. The operator ejects the types from the magazines by pressing suitable keys, and they are set up in long lines to be justified by hand. The distributor consists of a horizontal wheel with radial channels, in which the types to be distributed are placed. The frame surrounding the wheel contains other radial channels having projections corresponding to the nicks in the types. The movable magazines are placed radially in connection with these outer channels. When the wheel slowly revolves, the types pass from the channels of the wheel into the outer channels whenever a type comes opposite one whose projections correspond to its nicks. The MacMillan machine is a fairly typical example of the separate setting and distributing machine. Both the Thorne and the MacMillan machines set types which are previously made by the regular type-founding process. (See TYPE FOUNDING.) This is a distinction which should be noted before proceeding further, since the Mergenthaler and Lanston machines, instead of composing previously cast types, themselves cast the types as they are desired by the operator.

The Mergenthaler 'Linotype' machine was invented by Ottmar Mergenthaler, and the first ma-

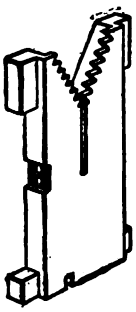


Fig. 1. MATRIX FOR MERGENTHALER MACHINE.

chine was completed in 1884. This machine takes its name from the fact that it sets up a line of molds, and casts a line of type, or rather a solid metal bar with raised letters on one edge, which is known as a 'slug' and is the same as if a line of types were fused solid. These molds or matrices are small pieces of sheet metal, each with a letter impressed on its edge, as shown in Fig. 1. They are placed in magazine tubes, as shown in the illustration, Fig. 2, all the *a*'s in one tube, all the *b*'s in another, and so on, the tubes being arranged vertically in a continuous line. The machine has a keyboard like a typewriter, and the depression of a key as D, connected by a rod, C, with the escapement, B, causes a matrix to drop into an inclined channel, E, down which it falls to the inclined traveling belt, F, by which it is carried to the assembler, or stick, G, where it takes its place in line. The spaces, I, between words are simply duplex wedges, dropped into position from a box, H, in the same way as the matrices when the finger key, J, is pressed. When the compositor has set all that will go into a line, the duplex wedges are slid one upon another, thus 'spacing out' the line, and the line so formed is carried over in front of a slot on the wheel K, where automatically the line of type is cast with metal from the reservoir, M, shown in detail in Fig. 3, and its sides and base planed, after which the mold wheel, K, makes a quarter of a revolution and the slug is deposited on a galley. The matrices meanwhile are released and passed overhead to the bar, R, where thin teeth engage on its horizontal ribs. This bar rises as shown by the dotted line, and the matrices are carried up to the distributor, T, whence they find their way to the appropriate magazine tubes, each matrix being released at the proper point. A speed of 4000 ems an hour is the average rate of a good Linotype operator, while those unusually expert attain as high a speed as 5000 to 6000 ems. The advantages of this machine are, among others, that it gives constantly a new type-face to print from, and also that there is no distributing to be done, the slugs being remelted after they have been used. The 'spacing out' device is another and a very decided advantage. The Linotype machine has become the most extensively used of any machine ever devised for the mechanical composition of types, and in its latest form performs successfully the most intricate kinds of composition, including tabular matter and the use of several classes of characters.

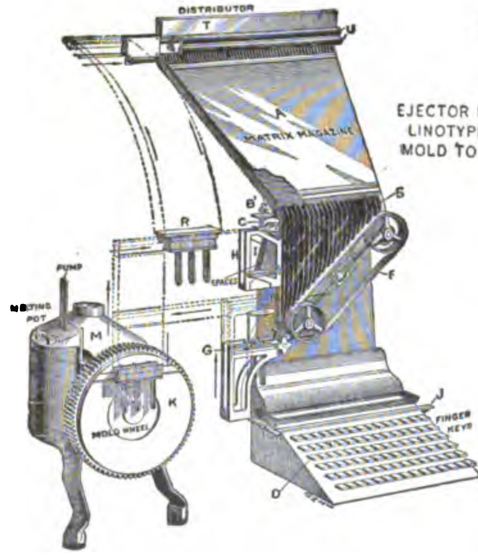


Fig. 2. MERGENTHALER LINOTYPE MACHINE SHOWING ESSENTIAL PARTS.

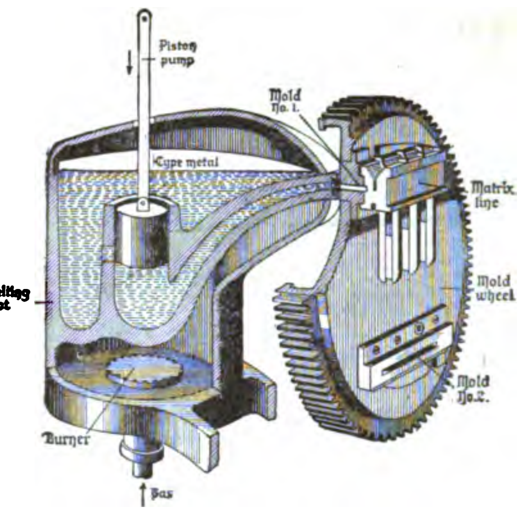


Fig. 3. MELTING POT, MOLD WHEEL, ETC., OF LINOTYPE MACHINE.

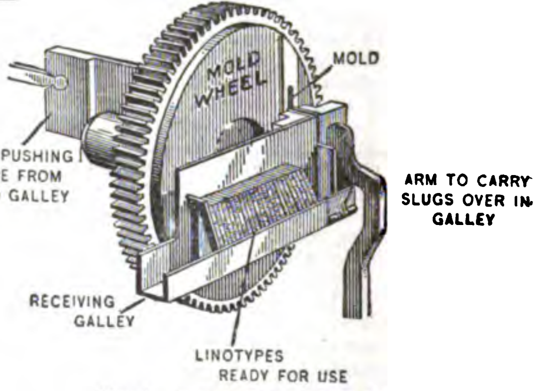

MOLD WHEEL
MOLD
EJECTOR PUSHING LINOTYPE FROM MOLD TO GALLEY
ARM TO CARRY SLUGS OVER IN GALLEY
RECEIVING GALLEY
LINOTYPES READY FOR USE

Fig. 4. MOLD WHEEL OF LINOTYPE MACHINE.

The Lanston 'Monotype' machine, like the Mergenthaler 'Linotype,' is primarily a type-casting machine, but with the radical distinction that it casts separately each letter, point, and sign, including the spaces. The machine is constructed in two parts, viz. a keyboard and a type-casting machine. The function of the keyboard is to punch a series of holes in a moving strip or ribbon of paper, which is unwound from one spool to another, passing under a series of punches in its journey. These punches are operated by striking the keys on the keyboard. The result of the keyboard operation is, therefore, a roll of perforated ribbon. This ribbon, when fed to the casting machine, initiates and controls all the operations which produce the cast type set in column width ready to take printed proofs from. See PRINTING.

TYPEWRITERS. Machines for producing legible characters without the aid of movable type. Like most important inventions its construction was gradually developed through many years of experimentation.

EARLY TYPEWRITERS. The first typewriter of which we have any record was patented in England as early as 1714. Over a century later, in 1829, the first American typewriter, called a typographer, was patented by W. A. Burt. In 1833 a typewriter was produced in France, having a separate key lever for each letter. In 1844 and in 1846 typewriting machines were invented in England, which, like many of the other early machines, were designed primarily for the use of the blind and so produced embossed characters. Between 1840 and 1860 Sir Charles Wheatstone invented several typewriters which are now in the South Kensington Museum.

Among early American inventors were Charles Thurber and A. E. Beach. The Thurber machine, brought out in 1843, is simply a set of type-bars in a vertical position around a horizontal brass wheel, sixteen inches across, which revolves about a central post, the characters being brought into position by hand from either direction. Common types are inserted in the lower ends of the type-bars. In 1856 A. E. Beach, who, as early as 1847, had constructed a fairly successful but never perfected typewriter, took out a patent for a machine intended to print embossed letters for the blind. This is worthy of record, because it covered a principle afterwards developed into the modern typewriter—namely, a basket of levers arranged on a circle, so as to deliver their impressions on a common centre. In order to make raised letters there were two sets of bars, one coming up and the other down, one having a raised letter and the other its mate, a sunken or intaglio letter. The strip of paper was grasped between the two.

Beach was followed by S. W. Francis. To the Beach principle of a circle of type-bars Francis added the pianoforte action. Another of the early inventors was Thomas Hall, who was carrying on independent experiments about the same time as Beach and Francis. Although his machine embodied the principle of a circle of type-bars, yet their movement, instead of being from below upward, was from above downward, converging at a common centre, an inked ribbon intervening between the type and the paper. But Hall was compelled to abandon his efforts without realizing his great expectations, and only a few of his typewriters were ever made. In 1881 he took out a patent on a typewriter made on an entirely different plan. It had a perforated dial plate, two inches square, containing seventy-five characters. Underneath this dial plate in his latest machine, called the Century, patented in 1889, was a rubber-faced cylinder with letters on its surface corresponding to those on the dial plate. When the stylus is brought to any perforation in this dial plate, the cylinder beneath is turned to present the corresponding letter to the paper, and the stylus being pressed into the hole the letter is printed. The under cylinder revolves against an inked pad.

About 1867 Charles Latham Sholes, Samuel W. Soule, and Carlos Glidden, of Milwaukee, Wis., began to experiment on the construction of a typewriter, and from their experiments the Remington typewriter had its origin. The first crude working model was completed early in 1868. Soule dropped out of the enterprise almost immediately and Glidden finally disposed of his interest also. Sholes, encouraged by the suggestions and financial aid of James Densmore, of Meadville, Pa., who early purchased an interest in the machine, continued his experiments. Several models were built and were tested by practical stenographers. One after another these machines were demolished, and Sholes would probably have given up the enterprise if it had not been for the energy and perseverance of Densmore, who insisted that, as the machines were designed for popular use, the severe practical tests were just what was necessary to enable them to arrive at correct principles of construction.

In 1873 the inventors considered the machine sufficiently perfected to warrant manufacture upon a larger scale than their facilities or means permitted. A successful effort was made to interest the gun manufacturers, E. Remington & Son, of Ilion, N. Y., in the manufacture of the machine. In spite of all the money and ingenuity already expended upon the device, it was still in a very defective condition. More than a year of patient work by the skilled mechanics of the Remington factory followed, resulting in a complete remodeling of the crude device of the inventors. The first model was put upon the market in 1874. It retained only the principles of the original construction. It may be briefly described as follows: Pivoted about a horizontal ring are type-bars, some thirty-eight in number, with steel types inserted in their lower ends, and so arranged as to rise vertically to a common centre. The short arms of these levers are connected by wire rods with the levers proceeding from the keyboard. The paper to be printed passes around a rubber cylinder, and the lower side of this cylinder receives the impact of the types. An inked ribbon intervenes between the type and the paper. This ribbon, in the operation of the machine, is gradually unwound from a spool at one side of the machine to another on the other side, and when the spool is exhausted the motion is reversed. With each release of a key by the finger of the operator, a ratchet movement at the back of the cylinder allows the carriage to move along one space, thus making room for the next letter. The tension is kept on the carriage by a coiled spring and strap. At the end of a line the carriage is drawn back to the starting point by means of an arm depending in front, and the same movement turns the cylinder, and carries the paper to make ready for the following line.

In 1877 an improvement was introduced, whereby each type-bar in the circle was made to carry two characters, adjusted to separate common centres. By depressing a shift key the carriage is thrown backward to the second centre, which is adjusted to receive all the capital letters and many other characters placed in relation thereto. This double-alphabet machine measured fifteen inches along the side, twelve inches across the front, and about nine inches in height, and weighed about twenty-three pounds.

In 1894 an improved model, having a lighter and stronger paper carriage, was placed upon the market. The shifting movement was accomplished by a new mechanism, and improvements in the spacing mechanism, greatly increasing the speed of the machine, were also introduced. An automatic ribbon reverse was later included, and many minor points of improvement have been from time to time adopted by the manufacturers. The growing expertness of operators rendered the improvements in speed especially acceptable. This new model writes with seventy-six characters in a line seven and a half inches long. Special companion models subsequently introduced possess eighty-four characters, and one can hold paper from standard width to twenty-seven inches for certain special requirements.

The Remington may be regarded as the pioneer machine. Its first competitor was the Caligraph, largely promoted by George W. N. Yost, who had for a time obtained a small interest in the sale of the Remington machine in its early years. This machine, like the Remington, had a circular basket of type-bars, and in many respects resembled its rival. In this machine the so-called shift from capital to small letters was done away with, and there was a separate lever and type-bar for each character. Horizontal levers, with which the keys were connected, were also hinged at the front, instead of the back. The carriage was supported, and was adjusted much the same as in the Remington, but was actuated by a torsion spring about a rod extending from the front to the back of the machine frame, where a vertical arm connected with the carriage frame above. The cylinder had a polygonal surface, the impressions being received on the faces. This machine has in recent years been superseded by an entirely new model, known as the New Century, which involves in many cases a radical departure from the earlier construction. Mr. Yost retired from the company and introduced another machine, which bears his name. The Yost does not employ an inked ribbon, like most typewriters, but its type-bearing levers, when at rest, occupy a position in which the types are all arranged within and bear against a circular inking ring or pad, and when a key is struck, its lever leaves the inking pad, moves inward and backward toward the centre, and then rises and strikes an upward blow in the centre, and prints the letter on the paper.

The first Hammond machine was invented by James B. Hammond in 1880-83. Its central principle was the type-wheel, a favorite device of John Pratt, who labored for a long time, but unsuccessfully, to make his invention a practical success. The arrangement of the original keyboard of the Hammond differed materially from that of the Remington, being almost semicircular. In 1890, however, a new model, termed the Universal Hammond, was introduced, having a keyboard with three banks of keys, like other standard machines. Still later, a light rubber shell or shuttle, supported by a metal backing, was substituted for the wheel. In this latest machine the ninety types are cast in true alignment upon a curved plate of vulcanite, called the 'shuttle,' in the form of an arc of a circle. The backing for the shuttle is a heavy cast-iron ring called 'anvil,' and may be compared to a wheel having a slot in the centre of its face in which the steel web of the shuttle slides. This forms a guide for the shuttle in its horizontal movements. The anvil is stationary and firmly fixed to a vertical shaft by which it may be raised to bring either of the three rows of type into the printing position. The depression of a key controlling the character to be printed brings that character on the shuttle into position by means of a shuttle arm and a series of index pins, each one of which corresponds to the angular distance of any character from the normal position. The impression of the hammer is at that moment received by means of a lever, which releases the hammer spring and the carriage and forces the paper against the type on the face of the shuttle. As these shuttles are interchangeable, it is possible for the one machine to produce any number of different alphabets or styles of type.

In 1889 the Chicago typewriter was placed upon the market and at once attracted attention on account of the simplicity of its mechanism and its comparatively low price. It has a longitudinally placed steel type-wheel, arranged to be held both longitudinally and circumferentially by stop-pins engaging directly with notches in the ends of the type-wheel. Like the Hammond and other type-wheel machines, the type is interchangeable and can readily be removed and replaced by type of another style or language.

In 1889 the Smith-Premier was also placed upon the market and rapidly assumed its rank among standard machines. This typewriter, like the Remington, is a type-bar machine, but has a separate key for each character, the keyboard being rectangular, with seven banks of keys. A novel feature of the machine is the type-cleaner, a revolving brush, fitted with a threaded shaft which, upon being turned with a detachable crank, is brought in contact with the type and brushes the entire set.

In 1892 the Blickensderfer machine was introduced, and, like the Chicago, at once attained great popularity on account of its simplicity and low cost. With the exception of the Blickensderfer, the machines described were all introduced prior to 1890. During the closing decade of the century many new machines were brought upon the market, so that at its close there were over 100 different machines, on which nearly 1700 patents had been granted. Besides the so-called standard machines, there are a large number of 'try' machines in use.

Typewriters for printing in books have also been invented and have proved very successful. The Elliot & Hatch book typewriter is a well-known example of this class of machines in which the whole carriage and system of type-levers move and the book remains stationary.

MANIFOLDING. Reprints may be secured by the ordinary copy-press (see COPYING MACHINES), copying ink being used on the typewriter ribbon or pad. By the use of carbon paper alternately between thin sheets of ordinary paper, the typewriter itself can be made to produce several copies at a time, while by the use of a special kind of paper on a sheet of cloth stencils may be made for the mimeograph. See COPYING MACHINE.

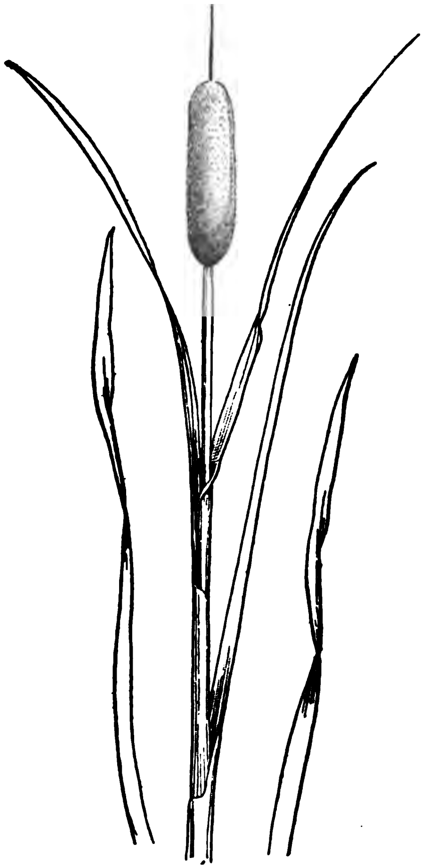
The rapid growth of the use of the typewriter is noteworthy. It was placed on the market in the early seventies and its usefulness was soon appreciated by courts of law, business houses, and governmental departments. In the early eighties its use became general in all departments of Government except the Department of State. It was first used for instructions to diplomatic and consular officers in 1895. The official communications of the Department to diplomatic officers of foreign countries were first executed upon the typewriter in 1897. Ceremonial letters addressed to sovereigns are still hand-written. The Twelfth Census contains an account of an interesting list made by the United States Department of Labor of the comparative speed of typewriting and hand labor. "In this instance the unit required was the copying of 1000 words of statute law; this was accomplished by the typewriter in 19.5 minutes, or at the rate of 51 words per minute, while a copyist with a pen required 1 hour and 14.8 minutes, or about four times as long. The quantity of work done by the typewriter depends to a great extent upon the skill of the operator, but it is true also that the proficiency of the copyist enters largely into the quantity of the work performed by him. However, it is possible to determine an average, and the figures given may be accepted as a fair and reasonable comparison of the two methods."

Typewriters are now an essential part of the equipment of telegraph offices, for so rapidly can messages be transcribed that the receiving operator can not only keep pace with the sender, but can maintain speed so great as to bring about the abbreviation of the telegraphic code.

Recently attention has been directed to the production of power typewriters, in which the operator has merely to touch a key with sufficient force to release latent mechanism, whereupon power from some external source completes the impression. In electrical typewriters, of which several have recently been patented, the impression mechanism is operated by magnets, the operator closing the circuit when he touches the key.

STATISTICS. According to the census of 1900 there were in the United States 47 typewriter factories, in which a combined capital of $8,400,431 was invested. These factories produced in 1900 144,873 typewriters, valued at $5,624,172. Of the total product $2,697,544 worth, or nearly half the total number, were exported. The enormous growth of the industry during the last decade of the century is shown by the fact that in 1890 there were only 30 factories, having a capital of $1,421,783 and producing an output valued at $3,630,126. That is, the number of establishments increased 56.7 per cent.; the capital invested, 490.8 per cent.; and the value of the product, 91 per cent.

TYPHA (Neo-Lat., from Gk. *τύφη*, *typhē*, cat-tail). A genus of widely distributed marsh plants of the natural order Typhaceæ. Two species are American, *Typha latifolia* and *Typha angustifolia*, and are popularly known as cat's-tail or reed-mace. The former, which is the commoner, is sometimes called bulrush. It grows to the height of five or six feet. The astringent rootstocks are rich in starch, and the young shoots of both species are much eaten by the Cossacks of the Don, and are sometimes used in England under the name of Cossack asparagus. The pollen of Typha is inflammable, like that of Lycopodium, for which it is used as a substitute. *Typha angustifolia* and *Typha elephantina* are employed in India and Europe for making mats and baskets, chair bottoms, etc. The leaves of Typha are commonly used in the United States in cooperage to place between the staves and in the seams of barrel heads.



CAT'S-TAIL (*Typha latifolia*).

TYPHLOP'IDÆ. See BLINDWORM (2).

TYPHOID FEVER (from Gk. *τυφώδης*, *typhōdēs*, delirious, from *τῦφος*, *typhos*, stupor, mist, vapor, smoke, from *τύφειν*, *typhein*, to smoke; connected with Skt. *dhūpa*, smoke) or ENTERIC FEVER. A specific disease, infectious chiefly or entirely through the excretions, having a febrile period of about three weeks, and characterized by ulceration of the intestinal lymph follicles, swelling of spleen and mesenteric glands, and parenchymatous changes in many organs.

Typhoid fever is due to the presence in the body and to the effects upon the body-tissues of a specific micro-organism known as the typhoid bacillus, or bacillus typhosus. This is a small bacillus with rounded ends about two micromillimeters in length and about one-third as broad. It is motile and grows at room temperature on the ordinary culture media, preferably in the presence of air or oxygen, but capable of life without. (See Plate of DISEASE GERMS.) Whether growing in the body or on artificial culture media, the bacillus produces a poisonous substance known as typhotoxin, belonging to the same general class as the toxins of diphtheria, tetanus, etc. During typhoid fever the bacillus is found regularly in the intestinal and mesenteric lymph nodes and as a rule in the spleen. In the early stage of the disease, when the nodes are simply enlarged, few or no bacilli are present in the bowel evacuations. Later, when ulceration of the nodules has occurred, the bacilli are usually found in the stools. In urine and bile it is quite common to find the typhoid bacillus, and in these secretions they may persist long after the passage of the fever, thus furnishing possible sources of infection long after the danger is supposed to have passed. Typhoid bacilli have also been reported in the blood, lungs, pleura, liver, kidney, uterus, and in other organs in which typhoid lesions occur; also in typhoid serous exudates and in the heart in typhoid endometritis.

Contraction of typhoid fever is believed to be always caused by the taking of the bacilli into the mouth and thence into the intestine. Food and drink are usually the vehicles which serve for the entrance of the bacillus, water and milk being probably the most frequent sources of infection. The latter is especially dangerous from the fact that the typhoid bacillus not only lives but multiplies in it. Water and milk, however, are only dangerous when they actually contain the typhoid bacilli which have entered into them from the excretions of typhoid patients.

The initial seat of activity of the typhoid bacillus is undoubtedly in the intestines. Here the bacillus first sets up a catarrhal inflammation of the mucous membrane. This is followed by the most characteristic lesion of typhoid, namely, inflammation of the intestinal lymph-nodes. Both solitary nodules and Peyer's patches are affected, although it is in the latter that the changes are usually most marked. There is first congestion of the nodule and of the surrounding tissues, then increase in the size of the nodule. This increase in size of the nodule appears to be due to a proliferation of its cellular elements. Thus there is more or less extensive increase in number of the lymphoid cells and of the endothelial cells which line the lymph-sinuses. When the inflammation is severe it may extend not only peripherally to the tissues laterally adjacent, but also into the deeper tissues of the intestinal walls involving the muscular and serous coats. These changes are apparently due to the presence in and effects upon the nodules of the typhoid bacillus. Such inflamed nodules may undergo resolution. The results of the inflammation may be absorbed or cast off, or both, and the nodules return to their normal condition. On the other hand, in the more severe grades of the infection, the nodules, instead of undergoing such early repair, go on to necrosis and to the formation of the so-called typhoid ulcers. These ulcers are formed in Peyer's patches, gradually increase in size, and discharge into the intestines. (See PEYER'S GLAND.) Not infrequently they open up blood vessels of considerable size and thus cause one of the gravest accidents of typhoid fever, namely intestinal hemorrhage. Or an ulcer may eat its way through the muscular and serous coats and, opening into the peritoneum, produce what is known as a 'perforation.' This, probably the gravest accident of typhoid, allows bacteria and intestinal contents to soil the peritoneum and leads frequently to the setting up of a general and rapidly fatal peritonitis.

Changes in the liver and spleen are of common occurrence in typhoid fever. Of the two the spleen is most frequently affected. This might be expected on account of the character of the spleen as a lymphatic organ. The changes consist of congestion with proliferation of the cellular elements of the spleen and consequent increase in the size of the organ. Of the conditions which may be present in the liver, the most common is a simple acute degeneration, such as occurs in other infectious diseases.

Lesions not distinctly a part of, but more properly the result of, the typhoid lesions also occur. Thus, in addition to the inflammation of the intestinal lymph nodes already described, there may be extensive involvement of the intestinal mucous membrane. This may lead to gangrene of considerable areas or to the formation of false membranes. Extension of the inflammation through the muscular coat may cause infection of the serous coat and, setting up a localized peritonitis, result in the formation of adhesions. Involvement of lymph glands in other parts of the body may be secondary to the typhoid lesions in the intestinal glands.

Cases of typhoid infection resembling septicæmia, presenting no characteristic lesions and recognizable only by the finding of the bacillus typhosus, have been reported.

Typhoid fever is widely distributed throughout the world, but is especially prevalent in the temperate zones. From its prevalence during the autumn it has been called autumnal fever. Young adults are usually attacked, the affection being comparatively rare among children and old persons. Hot and dry weather are favorable for its development.

The incubation period of enteric fever lasts from 8 to 14 days, or, exceptionally, longer. The onset is gradual, feelings of lassitude and malaise being followed by nausea, loss of appetite, headache, pains in the back and extremities, nosebleed, and perhaps a distinct chill. For a few days the patient may go about his work, but at the end of that time is compelled to go to bed. This may be reckoned the definite onset of the disease. The fever is very characteristic. During the first week the temperature rises steadily by a degree or a degree and a half a day until 103° to 105° F. is reached; during the second week the fever remains high; during the third week, in cases of moderate severity, it gradually declines, and in the fourth week convalescence begins. The pulse is rapid, full and soft, and the respirations increased in number. About the 7th to the 10th day the patient presents the typical appearance of enteric fever. He is dull, listless, and apathetic, the eyes are bright, the pupils dilated, the face pale, with flushed cheeks and dark lips. The tongue is dry and red, with a band of white fur on each side. At the end of the first week a rose-pink rash appears on the abdomen. It consists of from ten to thirty raised circular spots, which fade on pressure. These spots last only two or three days, but successive crops appear. The abdomen is distended and tender, and several offensive yellow stools may be passed daily. Death may occur at the end of the second week, from hemorrhage or perforation of the bowel. The third week is marked by great weakness, muscular tremors, delirium, and failing heart, although the fever is slowly dropping, and death may take place from exhaustion. Hemorrhage of the bowel is heralded by a rapid collapse. Convalescence in the average case sets in during the fourth week. The fever abates and appetite and strength gradually return. In a certain number of cases relapses occur; these are, as a rule, shorter and milder than the original attack, but are similar in character. One attack of enteric fever confers immunity from others. The mortality ranges from 10 to 30 per cent.

There are several clinical varieties of typhoid fever. *Mild* and *abortive* forms are characterized by a shorter course and speedy recovery (8 to 10 days), although the onset may be sudden and severe and the symptoms similar in kind to the graver attacks. In the *latent* or *ambulatory* type the onset is mild and the patient does not take to his bed until the disease is well advanced. Hemorrhage or perforation of the bowel may be the first marked symptom of this type; in other instances delirium sets in and the patient goes through a very severe attack. This form is very fatal. *Hemorrhagic* typhoid is a rare form characterized by cutaneous or mucous hemorrhages. Exceptionally, typhoid runs its course without elevation of temperature (the *afebrile* type).

To prevent the spread of typhoid the following precautions are observed. The stools and urine of patients are thoroughly disinfected by immersion in strong solutions of corrosive sublimate, carbolic acid, or chlorinated lime. In districts having a defective drainage system the dejecta may finally be disposed of by mixing with sawdust and burning or burying in trenches after saturation with chloride of lime. Bed pans, rectal thermometers, syringes, tubes, and all other utensils coming in contact with the patient's discharges are disinfected by boiling and immersion in antiseptic solutions. Bedclothes and linen are similarly disinfected. During epidemics drinking water and milk should be boiled and raw vegetables such as lettuce and celery avoided.

Careful nursing and regulated diet are of first importance in the treatment. The patient is strictly confined to bed from the beginning of the disease until the temperature has been normal for at least a week. A liquid diet has been found best throughout the course of the attack. The best food is milk, to which may be added lime water or vichy; or it may be peptonized. Broths, consommé, albumen water, or beef juice are given where milk disagrees or to vary the diet. The patient is urged to take plenty of cool water, and the juice of an orange or lemon may be given at intervals. Food is taken about every three hours during the day, and once or twice at night if there is great exhaustion.

Control of the fever is the most important element in the direct treatment of typhoid, and this is best accomplished by means of cold water, by sponging, the wet pack, and bathing. Sponging is valuable when a full bath cannot be given and for children and delicate persons. The cold pack consists in wrapping the patient in a sheet wrung out of water at 60° or 65° and sprinkling cold water over the body with an ordinary watering pot or similar device. The full bath, or 'cold tubbing,' was introduced by Brand of Germany, and this treatment is now almost universally followed in hospitals. By its use the fever is reduced, sleep is obtained, all the symptoms are rendered less intense, and the mortality greatly lowered. In giving the Brand bath the entire body except the head is immersed in water, beginning at a temperature of 70°, which is gradually lowered by adding pieces of ice. The bath lasts 15 or 20 minutes and is given whenever the fever rises above 102½° F., or on an average of once in three hours. Vigorous rubbing of the trunk (with the exception of the abdomen) and extremities in order to prevent chilling and to increase the stimulating effect of the bath is kept up while the patient is immersed. After tubbing the patient is wrapped in blankets and hot-water bottles put to the feet. This procedure is usually followed by a refreshing sleep. The drug treatment of typhoid is symptomatic. Bathing renders febrifuges unnecessary. Antipyrine and phenacetin are sometimes given, but they tend to depress the heart. Intestinal antiseptics, such as turpentine, salol, and carbolic acid, render the stools less offensive and prevent the production of gas. Return to solid food must be gradual on account of the danger of perforation through intestinal ulcers.

WIDAL'S TEST FOR TYPHOID FEVER. This is a comparatively newly discovered method of diagnosis. It depends upon the fact that the blood of typhoid-fever patients acquires the property of causing a reaction when brought into contact with active typhoid bacilli. In the actual test a small amount of blood or serum (either fresh or dried), diluted, is mixed with a fresh pure culture of the typhoid bacillus. The result may be watched in a hanging drop with a high-power lens. It consists in a destruction of the motility of the bacilli and their agglutination, that is their collection into larger or smaller clumps. The reaction may not occur in the first stages of the disease. A positive result with quite dilute serum makes the diagnosis of typhoid almost certain, although the reaction does sometimes occur in other diseases, especially in the one often most difficult to differentiate clinically from typhoid fever, namely acute miliary tuberculosis.

Serum inoculations for the prevention of typhoid fever have been recently introduced. The method is known as Haffkine's. The fluid injected is an emulsion of the typhoid bacillus after the bacilli have been killed by heat. Favorable results from the use of this serum have been reported. See SERUM THERAPY.

Consult Curschmann, "Typhus and Typhoid Fevers," in *Nothnagel's Encyclopedia* (Eng. trans., Philadelphia, 1901); Osler, *Studies in Typhoid Fevers* (Baltimore, 1895) and *Problems of Typhoid Fever in the United States* (ib., 1899); and Strümpell, *Textbook of Medicine* (Eng. trans., New York, 1901).

TYPHON (Lat., from Gk. Τυφῶν), or TYPHOËUS. In Greek legend, the offspring of Gæa, or Earth, and Tartarus. He was a fire-breathing monster with one hundred serpent heads, who after the overthrow of the Titans strove to wrest the power from Zeus. He was finally smitten by the thunderbolt and cast into Tartarus. By Echidna he was the father of many monsters who were destroyed by Hercules. Typhon seems to be the personification of the volcanic elements, and the scene of the conflict is at first in the volcanic regions of Lydia and Phrygia, and later about Etna and Stromboli, while the description in Hesiod of the battle with Zeus is a vivid picture of a violent eruption. For the Egyptian Set-Typhon, who later influenced the Greek story, see SET.

TYPHOON (Port. *tufão*, from Ar. Pers. *tūfān*, tempest, hurricane, from *tūfānīdan*, to roar, cry out; cf. Gk. Τυφῶν, *Typhōn*, Typhon (q.v.); also Chin. *t'ai fung*, great wind, Formosan Chin. *tai fŭng*, typhoon). The name applied to the hurricanes that visit the waters east of Asia. From a meteorological point of view the typhoon is a special case of the so-called cyclonic storm. Typhoons usually originate far to the east and nearer the equator than Manila; they move toward the west or west-northwest, but gradually curve so that they often pass northward or northeastward along the coasts of China and Japan. Typhoons appear to be quite as severe on the average as the West Indian hurricanes; the barometer falls even lower at the centre, and the rainfall is probably heavier. Knowledge of the laws of typhoons is now sufficient to justify cautious predictions of their paths and the issuance of storm warnings to navigators. All the baguios and typhoons of the North Pacific Ocean have been classified as follows by Doberch, Algué, and Bergholz:

Group 1 occur between December and March; the storms originate between 5° N. and 12° N., and 145° E. and 143° E.; move at first toward the north-northwest; reach the vertices of their parabolic orbits in latitude 15°-19° N. and then turn toward the north-northeast.

Group 2 occur in April and May or October and November; originate between 129° E. and 147° E. and 5° N. and 12° N.; move toward the northwest; have their vertices in latitude 16°-21°, and then move toward the northeast.

Group 3 occur between June and September; originate between 139° E. and 126° E. and 20° N. and 8° N., move at first toward the northwest by north; have their vertices at 21°-25° N. and then turn to the northeast by east.

When typhoons reach the China Sea in the months of December-March they generally continue onward toward the east-northeast, and are lost in the interior of the country. Those that occur in the summer and spring months recurve much more frequently, attain higher latitudes, and are frequently destructive in Japan and adjacent waters; occasionally these continue moving northeast until they reach Bering Sea or the Aleutian Islands. Full details of typhoons are published regularly by the meteorological offices of Hong Kong, Tokio, and Manila, and their general tracks, together with occasional special studies, are published on the Pilot Charts of the Pacific Ocean, published monthly by the United States Hydrographic Office.

TYPHUS FEVER (Neo-Lat., from Gk. τῦφος, stupor, mist, vapor, smoke), JAIL FEVER, SHIP FEVER, or SPOTTED FEVER. An acute, specific and highly contagious fever, endemic, and also prevailing in epidemics, especially in times of destitution and in the presence of overcrowding and bad ventilation, presumably due to a micro-organism, as yet undiscovered, and attended with no characteristic lesion of the tissues, as in the case of typhoid fever, but with serious alteration of the blood. It is ushered in by an abrupt onset, with marked nervous symptoms, rheumatic pains, rigors, and headache. A maculated eruption appears, most commonly on the fifth day of the disease, of slightly elevated spots, disappearing on pressure at first, afterwards persistent and darker, and there is early prostration of the nervous and muscular systems. Delirium usually comes on during the second week, sometimes of an acute and noisy character, but oftener of a low, wandering kind, with a tendency to stupor. The fever terminates by a crisis, which generally occurs on or about the fourteenth day, after which recovery is very rapid.

In former centuries typhus fever was a common scourge, in times of war and famine, under the names of jail fever, camp fever, ship fever, and the like. It is a disease of the temperate and cold zones, and this fact is regarded as caused to a considerable extent by the mode of life adopted by a great majority of the peoples of cold countries congregating, as multitudes of them do, in badly ventilated habitations. At the present time the disease is limited to half-civilized countries and to the slums of seaport cities. Local outbreaks sometimes occur on ships, and in jails and poorhouses. The mortality in different epidemics varies from 12 to 20 per cent. The disease is much more fatal after middle age than in the young. It was for a long time confused with typhoid fever (q.v.), but it differs from this in many ways.

The treatment of typhus is symptomatic. As the disease is exceedingly contagious, patients are promptly isolated and all objects that may have come in contact with them thoroughly disinfected. The high temperature is reduced by means of cold sponging, the cold pack, or bathing, and by the administration of quinine, antifebrine, or phenacetin. All patients are benefited by small doses of the mineral acids, and mild saline laxatives. For the headache and delirium cold applications to the head are indicated. Alcohol is used as a stimulant throughout the attack, to combat the great prostration. During convalescence such tonics as strychnine and quinine are most useful. The patient may be nourished by liquid foods.

TYPICAL PHRASE (Lat. *typicalis*, from *typicus*, from Gk. τυπικός, *typikos*, relating to a type, conformable, from τύπος, *typos*, type, figure, impress, blow). In dramatic music, the recurrence of a theme or phrase to mark the similarity of the dramatic situation between the part where such a phrase occurs and the part where it was first heard. The typical phrase is essentially different from the leitmotiv. Whereas the leitmotiv constitutes the basic material and is employed in the same manner as a theme in a symphony, the typical phrase is only a quotation, and can do nothing more than recall a similar situation.

TYPOGRAPHICAL UNION OF NORTH AMERICA, The International. The labor organization of the printers and those engaged in kindred trades, the oldest national trade union in the United States. It was organized in 1850 as the National Convention of Journeymen Printers, but assumed the name National Typographical Union in 1852, and the present name in 1869. The International Typographical Union is an industrial union and claims jurisdiction over all branches of the printing and kindred trades, except those over which jurisdiction has been conceded by agreement. In 1902 the International Typographical Union concluded an 'arbitration agreement' with the American Newspaper Publishers' Association to last until 1907, by which the former undertakes to arbitrate all trade differences with members of the Publishers' Association who agree by contract to accept arbitration. About 90 per cent. of the publishers have concluded such contracts.

In organization the International Typographical Union is a typical industrial union. Provision is made for the separation of the different trades into trade district unions, which retain a large measure of autonomy, although they combine for purposes of defense, in each jurisdiction where there are unions of more than one trade, in allied printing trades councils. The International itself, however, strictly regulates the maximum hours of labor of all members, the number of days' work per week, the method of securing work and the discharge of employees (through foremen, who must belong to the union), the employment of substitutes, type standards in the fixation of piece scales, the use of sub-lists (lists of authorized substitute workers), and the interchange between newspapers, not owned by the same company, of matter previously used either in the form of type, matrices, or photo-engraved plates. Of the receipts from the regular dues, one-sixth is apportioned to the general fund, one-fourth to the defense fund, one-fourth to the burial fund, and one-third to the endowment fund of the Union Printers' Home at Colorado Springs, Colo. In the fiscal year ending May 31, 1902, the receipts amounted to $151,141 and the expenditures to $145,760. The average membership in 1901 was 34,948. The official organ, *The Typographical Journal*, is published monthly at the headquarters in Indianapolis, Ind.

TYPOGRAPHY. See Printing.

TYR, tīr (Icel. *Tȳr*, AS. *Tīw*, OHG. *Zio;* connected with Lat. *Ju-piter*, Gk. Ζεύς, *Zeus*, the chief god, Skt. *dyāuṣ*, sky, and ultimately with Lat. *deus*, OIr. *día*, Lith. *dévas*, Skt. *dēva*, god). The old Norse name of a Teutonic deity. It is possible that in the early common Germanic system Tyr was the foremost god, whose place was later taken by Odin. In the Eddas he is represented as the son of Odin, and was the god of war and fame. When the Æsir (q.v.) persuaded the wolf Fenrir (q.v.) to allow himself to be bound with the cord Gleipnir, Tyr put his right hand in the wolf's mouth, as a pledge that he would be loosened, and when the gods refused to release Fenrir the wolf bit the hand off at the wrist. At the twilight of the gods he met his death at the same time with his enemy the monster dog Garm. See Ragnarök; Scandinavian and Teutonic Mythology.

TYRANT (Lat. *tyrannus*, from Gk. *τύραννος*, master, sovereign, connected with Skt. *turaṇyu*, pressing forward, *tar*, *tur*, to pass through, Lith. *tureti*, to have). A name given in modern times to an arbitrary and oppressive ruler, but by the ancient Greeks applied not necessarily to one that exercised power badly, but merely to one that obtained it illegally, or to one who held the sovereignty originally established by usurpation. While tyrants appear sporadically at all periods in Greek history, they were especially numerous during the seventh and sixth centuries B.C., when it was not difficult for an ambitious and unscrupulous man, often a noble, to appear as a leader of the populace and by its aid secure power. Often a violent seizure of the power was welcomed as affording relief from present evils. In other cases the 'tyrant' of the nobles was a lawgiver to the *demos*. These early tyrants seem usually to have ruled generously toward the poorer classes, but toward other nobles they were naturally suspicious and frequently stern and cruel. While there are cases in which ancient testimony declares the 'tyrant' a true tyrant in the modern sense, the greater number of these men seem to have aimed at a just rule, and the glory and prosperity of their States, and were frequently the patrons of literature and the fine arts. This is especially noticeable in the Sicilian tyrants of the fifth century B.C. After the Persian Wars, the development of democracy and the rise of Athens led to the passing away of this form of government, to revive with the general weakening of the Greek States. This later period of tyranny, which begins in the fourth century B.C., is not marked by so wide an extension of the evil, but, on the other hand, a few of the possessors of the power are men of extraordinary ability, who, having proved capable of restoring or rescuing an enfeebled State, have seized or been given the supreme control. Such were Dionysius I. of Syracuse and Jason of Pheræ. In general this second series of tryants were more cruel and arbitrary than the earlier generation. The *Thirty Tyrants* of Athens were only an oligarchical board established in the interest of Sparta in B.C. 404, and owed the name 'Tyrants' to later writers, their contemporaries referring to them as 'The Thirty.' Consult: Plass, *Die Tyrannis bei den Griechen* (Bremen, 1852); Zeller, *Ueber den Begriff der Tyrannis bei den Griechen* (Berlin, 1887); Schömann-Lipsius, *Griechische Alterthümer* (4th ed., ib., 1897).

TYRANT FLYCATCHER. See Fly-Catcher.

TYRCON'NEL, Richard Talbot, Earl and titular Duke of (1630-91). Viceroy of Ireland. He was the youngest son of Sir William Talbot, of County Kildare, Ireland, a prominent Roman Catholic politician during the reign of James I. He fought against Cromwell at Drogheda and after the death of Charles I. lived in Spain and Flanders. In his youth he was notorious as a sharper and bully and under the Protectorate he was recommended as a man fit to assassinate Cromwell. Soon after the Restoration he endeavored to obtain the favor of the royal family by blackening the reputation of Anne Hyde,, so as to furnish the Duke of York with a pretext for breaking his promise of marriage to her. Though unable to injure her reputation, he succeeded in gaining the favor of the Duke, and contrived to make himself welcome at the palace both as a votary of its pleasures and as a counselor in affairs of State. Immediately on the accession of James II. he was made Earl of Tyrconnel, and put in command of the troops in Ireland. He now aimed, by means of the Irish army, to make the King independent of Parliament. To this end he discharged Protestant soldiers, and favored Roman Catholics in every possible way, admitting them not only to the army, but to offices and corporations. This service he performed so well that in 1687 the King made him Lord Deputy of Ireland. His arrival in that country spread terror and dismay through the English Protestant population, who had already suffered under his military rule. Finding themselves without protection and their property a prey to marauders, many of them left the country, commerce declined, and economic conditions became wretched. But this state of affairs did not last long. On the arrival of James II. in Ireland in 1689, after his flight from England, he created the Earl Duke of Tyrconnel. After the fatal battle of the Boyne (1690), in which the Duke held high command, he retired to France. In 1691 he returned to Ireland, to further the cause of James. Notwithstanding the defeat of Aughrim (July 12, 1691), and the capitulation of Galway, Tyrconnel made preparations for the defense of Limerick, binding himself and his countrymen by oath not to surrender until they received permission from James, then at Saint Germain. At the same time, however, he dispatched a letter in which he stated his conviction that all was lost. On August 11th, before an answer could arrive, he was stricken with apoplexy, and died on the 14th.

TYRE, tīr (Lat. *Tyrus*, from Gk. Τυρός, from Phœnician *Ṣūr*, rock). The most important city of ancient Phœnicia, situated on the Mediterranean coast about 50 miles south of Beirut (Map: Turkey in Asia, F 6). It derived its name from the double rock lying just off the coast, which was the site of the earliest settlement. At present this portion of the city is connected with the mainland by a causeway which goes back to the days of Alexander the Great; before the Greek period, however, the older Tyre was an island divided by a natural canal into two parts. It has now been definitely ascertained that the old sanctuary to Melkart, the Baal or chief deity of Tyre, stood on the southwestern part of the little island, and with this determination the priority of the settlement of the island over the adjoining coast is also determined. From the island settlement the city grew until it included as a suburb the adjoining coast land, and after the union of island and coast the entire settlement was known as the city of Tyre. From a strategic point of view, the situation of Tyre was most favorable, while its admirable ports predestined it for the commercial rôle it was to play. Those ports were chiefly two, the 'Sidonian port' and the 'Egyptian harbor.' Whether Tyre or Sidon is the oldest settlement of Phœnicia is a question not easily answered. On the whole, the evidence is in favor of the latter, though the view formerly held, which made Tyre an offshoot of Sidon, must be abandoned in the light of recent researches. Herodotus records a tradition which traced the settlement of Tyre back to the twenty-eighth century B.C. The date may be somewhat too early, though when Egypt began her campaigns for the possession of Western Asia under Thothmes I. (c.1510 B.C.) Tyre was already a flourishing and important centre. A new period of prosperity began for Tyre with the decline of Egyptian control (c.1400 B.C.), and though we know little of the history of the place for the next three centuries the important position which it occupied when Tiglathpileser I. of Assyria (c. 1130 B.C.) opened his successful series of campaigns to the West justifies the conclusion that in the interval Tyre more than maintained her supremacy over Sidon and surrounding districts. It was a period of commercial extension, followed by a decline due to internal disturbances. It was not until c. 870 B.C., that, so far as present knowledge goes, an Assyrian king, Asshurnasirpal, included Tyre and Sidon in his campaigns and obtained tribute from these two cities as well as from Byblos and Arvad. Among the kings of this period known to us from a list of Menander preserved by Josephus is Hiram (B.C. 969-936), from whom Solomon, apparently as a vassal of Tyre, obtained material and workmen for his building operations. (See HIRAM; SOLOMON.) After the days of Asshurnasirpal, the compact between Tyre and Assyria remained uninterrupted, with the exception of short intervals. To save her commerce and her position of supremacy, Tyre preferred to pay tribute rather than risk an encounter at arms with Assyria. In the days of Sennacherib (B.C. 705-681), however, Tyre paid for a manifestation of independence by an encounter with the Assyrian monarch, which ended in a momentary defeat for the Assyrians. Tyre, however, was cut off from communication with the coast, and after enduring a siege of five years, according to Menander's annals, was obliged to submit (c. 700 B.C.) Tyre recovered from this blow and entered into a combination with Egypt to resist the advance of Esarhaddon, the successor of Sennacherib, who had to content himself with receiving the homage of King Baal of Tyre without actually capturing the city; but Asshurbanipal, his successor, finally succeeded toward the end of his reign (B.C. 668-626) in forcing the city to surrender. Tyre became an Assyrian vassal, but her commercial position was unaffected, and the fall of Assyria (c. 607 B.C.) enabled her once more to assert her independence. A fatal blow was dealt her by Nebuchadnezzar II. The city withstood a dire siege for thirteen years. At the end of that time (B.C. 572) her strength was exhausted, she yielded, and her old rival Sidon profited by the loss of trade which followed, to take up the superior position in the commercial world. The last native ruler of Tyre was Ittobaal. He was followed by governors appointed at the dictation of Babylonian rulers until the Persian conquest of Babylonia.

From that time on till the days of Alexander the Great the history of Tyre is that of a steady decline. It was taken by Alexander in B.C. 332

after a seven months' siege, and by Antigonus seventeen years later, after a siege of fourteen months. During the Roman period and in the Middle Ages it was still an important commercial town. It was captured by the Crusaders under Baldwin II. in 1124 and remained in the hands of the Christians till 1291, when it was taken and destroyed by Malik al-Ashraf, ruler of Egypt and Syria. It has never recovered its old importance. The present town (Ar. *Ṣūr*) has about 6000 inhabitants and offers few attractions. Consult: Jeremias, *Tyrus bis zur Zeit Nebukadnezars* (Leipzig, 1891); Krall, "Studien zur Geschichte des alten Aegyptens, iii., Tyros und Sidon," in *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften zu Wien*, vol. cxvi. (1888); Prutz, *Aus Phönizien* (Leipzig, 1876); Lucas, *Geschichte der Stadt Tyros zur Zeit der Kreuzzüge* (Berlin, 1896).

TYRNAU, or **TIRNAU**, têr′nou (Hung., *Nagy-Szombat;* Slav., *Trnava*). A town of Hungary, on the River Trnava, 25 miles northeast of Pressburg. It has a cathedral, dating from 1389, and a large episcopal palace. Tyrnau has manufactures of cloth, linen, vinegar, sugar, and malt products, and has a general trade, especially in wine. Population, in 1900, 13,281, mostly Slovaks and Magyars.

TYR′OL, or **TIR′OL**, *Ger. pron.* tē-rōl′. A crownland of Austria, united with Vorarlberg under one administration. It is bounded on the north by Bavaria, on the east by Salzburg and Carinthia, on the south by Italy, and on the west by Switzerland and Vorarlberg (Map: Austria, B 3). Area about 10,300 square miles. Tyrol is almost entirely covered by the Alps. It resembles Switzerland, except that it has no large lakes. The Lago di Garda, however, enters on the south. Through the northern part extends the valley of the Inn, with the Lech Alps on the northwest. The Inn is the most important river in the crownland. It becomes navigable at Hall, just below Innsbruck. The watershed in Tyrol between the Danube and the Po, separating northern from southern Tyrol, is formed by the Oetzthal Alps on the west (reaching about 12,500 feet) and by the Zillerthal Alps toward the east. The famous Brenner Pass lies between and marks the chief depression of the divide. In the Zillerthal group rises the Drave. It flows through the Pusterthal, and leaves Tyrol on the extreme eastern boundary. The southern end of Tyrol is mainly occupied by the valley of the Adige, with the remarkable Dolomite Alps on the east. The Adige flows south and enters Italy west of the Lessinian Alps, which line the Italian frontier. The Sarnthal Alps lie in the centre of Tyrol, at the eastern foot of the Oetzthal Alps. Tyrol contains and is bordered by numerous other groups of mountains. The Hohe Tauern (with the Gross Glockner peak, about 12,500 feet) forms the northeastern boundary, the Kitzbühl Alps lie on the Salzburg border, and the Ortler group enters from the southwest and forms the loftiest elevation in Tyrol—12,790 feet. The mountains of Tyrol are famous for their picturesque valleys. The climate is of great variety. In the north—the valley of the Inn—it is raw and cold, as is also the case in the Pusterthal. In the south, in the region of the Adige, the climate is hot in summer, and the lassitude of Italy is felt.

Tyrol is in general little adapted to tillage, the better portions being devoted mainly to meadows. About two-thirds of the surface is covered with forests. The agricultural sections are in the valleys in the northern and southern districts. Southern Tyrol is noted for its wine, and it grows much fruit. Zinc and sulphur are mined; also some coal, iron, and copper. The industries are not extensive. Cotton goods are produced in the Inn Valley and silk goods in the Adige district. Spinning and weaving as house industries are conspicuous. The wood-carving is famous. Carpets, iron wares, and marble are shipped, as well as cattle, lumber, and cheese.

There is a university at the capital, Innsbruck. Tyrol has a Diet of 68 members—34 representing the rural communities, 13 the towns, and 10 the landed aristocracy, the principal ecclesiastical dignitaries having seats in the body. The Statthalter in Innsbruck is at the head of the administration for Tyrol and Vorarlberg, but Vorarlberg has its own Constitution and Diet. Tyrol sends 21 members to the Lower House of the Austrian Reichsrat. The population in 1900 was 850,062, mostly Catholics. About 55 per cent. of the inhabitants are Germans, nearly all of the remainder being Italians and Ladins.

HISTORY. In Roman times Tyrol formed part of Rhætia, which was conquered by the Romans, B.C. 15. At the time of the great migration of nations it was overrun by various German tribes, including the Ostrogoths. The southern portion later fell into the hands of the Lombards, and the northern became subject to the Bavarians, who were subdued by the Franks. Ultimately the country was divided into a number of petty lordships, some under the suzerainty of the dukes of Bavaria, some under that of the bishops of Trent, and others under that of the bishops of Brixen. The whole of German Tyrol finally came into possession of one family, the counts of the Adige or of Tyrol (the latter being the name of their castle, so-called from the Roman Teriolis, near the site of which it stood). The last Count, who died in 1335, left one daughter, Margaret Maultasch. She bequeathed her rights to her cousins, the dukes of Austria, who thus acquired possession of Tyrol in 1363. The Italian slope remained in possession of the bishops of Trent, who were dispossessed in 1803. By the Treaty of Pressburg in 1805 Tyrol was ceded to Bavaria, much to the discontent of the people, who were warmly attached to the House of Austria. They made a gallant resistance to the French in 1809, under Andreas Hofer (q.v.), but were defeated. By the Treaty of Schönbrunn the county was divided into three parts, North Tyrol going to Bavaria, South Tyrol to the Kingdom of Italy, and the eastern part being annexed to the Illyrian Provinces. Tyrol was restored to Austria by the Treaty of Paris in 1814. The acquisition of Italian Tyrol forms part of the programme of the Italian irredentists. See IRREDENTISM.

BIBLIOGRAPHY. Baillie-Grohman, *Tirol and the Tirolese* (London, 1876); Busk, *The Valleys of Tirol* (ib., 1874); Schneller, *Landeskunde von Tirol* (Innsbruck, 1872); Achleitner and Uhl, *Tirol und Vorarlberg* (Leipzig, 1902); Haushofer, *Tirol* (Bielefeld, 1903); Purtscheller and Hess, *Der Hochtourist in den Ostalpen* (Leipzig, 1899). For history, consult: Huber, *Geschichte der*

Vereinigung Tirols mit Oesterreich (Innsbruck, 1864); Egger, *Geschichte Tirols* (ib., 1872-80).

TYROLIENNE, tē′rō′lyĕn′ (Fr., Tyrolese). A Tyrolese dance, or dance-song. It is best heard in the Zillerthal, in the Tyrolese Alps. A characteristic feature is the Jodler. See JODELN.

TYRONE, tī-rōn′ (Ir., *Tir-owen*, Owen's country). An inland county of Ulster, Ireland, bounded north by Londonderry, east by Armagh and Lough Neagh, south by Monaghan and Fermanagh, and west by the last-named county and Donegal (Map: Ireland, D 2). Area, 1260 square miles. The principal rivers are the Blackwater, the Foyle, and the Mourne. The northwestern mountains rise in Slieve Sawel to a height of 2236 feet. Between Dungannon and Stewartstown there is a small but productive coal-field. The soil of the plain is fertile; the hilly districts are sandy or gravelly, and devoted to pasturage. There are manufactures of linens and coarse woolens and earthenware. Population, in 1841, 313,000; in 1851, 255,700; in 1891, 171,401; in 1901, 150,470. The capital is Omagh.

TYRONE. A borough in Blair County, Pa., 15 miles northeast of Altoona, on the Little Juniata River, and on the Pennsylvania Railroad (Map: Pennsylvania C 3). It has considerable commercial importance, being an outlet for the Clearfield coal fields, and is noted especially for the manufacture of various paper products. There are iron works, tube works, planing mills, a tannery, and box and shoe factories. Tyrone is also an important railroad junction and has large repair shops. The Birmingham Female Seminary is three miles distant. The government is vested in a burgess, elected every three years, and a unicameral council. Tyrone was settled about 1811, and was incorporated in 1857. Population, in 1890, 4705; in 1900, 5847.

TYRONE, HUGH O'NEILL, second Earl of (1540?-1616). An Irish soldier and revolutionist. He was the grandson of the first Earl, his father, who was illegitimate, being Baron of Dugannon. His elder brother was murdered in 1562, and Hugh became Baron of Dugannon, for precaution being sent to England. In 1568 he returned to Ireland, and for some years had great difficulty in maintaining his position against his encroaching kinsmen. In 1580 he commanded a troop of horse in Munster against the rebel Earl of Desmond, and in 1583 was appointed commander of the northern marches. In 1585 he was allowed to style himself the Earl of Tyrone, and, strengthening his power in 1587, visited England to petition for a restitution of the whole of the lands granted to his putative grandfather by Henry VIII. In this he was unsuccessful, and, resenting the visit of commissioners sent to arbitrate his differences with his rival, Turlough Luineach, he attacked the latter, but was defeated. He was placed under restraint and shortly afterwards pardoned, but he entered on a course of intrigue to separate Ireland from England, offered the crown of Ireland to Philip II. of Spain, and after a comparatively successful campaign, in which he defeated Sir John Norris, he killed his brother-in-law, Sir H. Bagnal, and effected a truce with the Earl of Essex. In 1601 he was worsted by Lord Mountjoy, to whom he surrendered about the beginning of 1603. He was soon after pardoned. In 1607, being suspected of again conspiring, he fled to Brussels, afterwards proceeding to Rome, where he lived in penury until his death, on a small pension allowed him by the Pope and the Spanish King.

TYROTOXICON (Neo-Lat., from Gk. *τυρός*, *tyros*, cheese + *τοξικόν*, *toxikon*, poison). An alkaloid isolated from poisonous cheese, by Victor C. Vaughan, of Michigan, in 1885, and named by him in ignorance of the fact that Kuhn, of Leipzig, had given this name in 1824 to "a poisonous principle formed in cheese by putrefaction." Vaughan obtained his crystallizable principle by making a clear, filtered aqueous extract of the suspected cheese, which was highly acid, then treating with ether and evaporating the ether. His finding was corroborated by Schaeffer, Stanton, Firth, Ladd, Wolff, Novy, and others. The principle has been found in ice-cream and cream puffs, as well as in milk. To obtain it from poisonous milk, the milk (normally acid) is filtered, neutralized with sodium carbonate, agitated with ether, and allowed to stand twenty-four hours, after which the ether is evaporated. The residue is acidified with nitric acid and then treated with an equal volume of a saturated solution of potassium hydrate, and heated. The tyrotoxicon crystallizes in beautiful six-sided plates along with prisms of potassium nitrate. The chemical character of tyrotoxicon is not well defined.

The symptoms of tyrotoxicon poisoning are vomiting, diarrhœa, pain over the stomach, coated tongue, feeble and irregular pulse, pale and cyanosed face. In some cases the body is covered with spots. In others there is marked dryness and constriction of the throat. In all there is marked nerve exhaustion. The treatment of tyrotoxicon poisoning consists in emptying and flushing the digestive tract, and supporting the heart.

TYR′RELL, ROBERT YELVERTON (1844—). An Irish classical philologist, born at Ballingarry, County Tipperary, Ireland, and educated at Trinity College, Dublin. He was appointed fellow of Trinity College in 1868, was made professor of Latin in 1871, and held the office of regius professor of Greek from 1880 to 1898. He was a frequent contributor to English reviews, and edited and translated many classical works. The most important of his works are an edition, with Purser, of the *Correspondence of Cicero* (1879-1900); *Bacchæ of Euripides* (2d ed. 1897); *Troades* (2d ed. 1897); *Miles Gloriosus of Plautus* (2d ed. 1886); *Latin Poetry* (1895).

TYRRHE′NIAN SEA (Lat. *Tyrrhenum mare*). That part of the Mediterranean Sea which is inclosed between the islands of Corsica and Sardinia on the west, Sicily on the south, and the Italian peninsula on the east (Map: Italy, F 7).

TYRTÆ′US (Lat., from Gk. Τυρταῖος, *Τύρταιος*, *Tyrtaios*) (fl. c. 630 B.C.). A Greek lyric poet, famous for his political elegies and marching songs. According to Attic tradition, he was a lame schoolmaster of Aphidnæ, in Attica, of low birth, whom the Athenians, ignorant of his lyric power and jealous of the Lacedæmonians, sent to Sparta when the Lacedæmonians, at the advice of Delphic Apollo, asked them for assistance against the Messenians. The tradition, however, is only the invention of a late time. Tyrtæus was no doubt a Spartan, or an Ionian who had moved to Sparta. By his poems he aroused the Spartans and led them to victory over their foes. The fragments of his work are published by Bergk, *Poetæ Lyrici Græci*, 4th ed., vol. ii. (Leipzig, 1882).

TYR′WHITT, Richard St. John (1827-95). An English art-writer. He graduated at Christ Church, Oxford, in 1849, and was a tutor from 1852 to 1856. Ordained in the English Church, he was vicar of Saint Mary Magdalen at Oxford from 1858 to 1872. Tyrwhitt had an uncommon artistic insight and exhibited several water colors. But a lack of technical training led him to forego original painting for the interpretation of the work of others. Among his works are: *Concerning Clerical Powers and Duties* (1861); *Christian Art and Symbolism, with Hints on the Study of Landscape* (1872); *The Art Teaching of the Primitive Church* (1874); *Greek and Gothic: Progress and Decay in the Three Arts of Architecture, Sculpture, and Painting* (1881); *An Amateur Art Book: Lectures* (1886). He also published a novel and a volume of verse called *Free Field Lyrics* (1888).

TYRWHITT, Thomas (1730-86). An English scholar, born in London. He was educated at Eton and at Queen's College, Oxford, where he graduated in 1750. Five years later he was elected fellow of Merton, and called to the bar at the Middle Temple; but he never practiced the law. From 1756 to 1762 he was Deputy Secretary of War, and from 1762 to 1768 clerk of the House of Commons. Both of these positions he resigned, for they interfered with his studies. Tyrwhitt is now best known for his edition of Chaucer's *Canterbury Tales* (4 vols., 1775; 5th vol. 1778). He also punctured the Chatterton bubble (1778 and 1782). His classical scholarship is represented by a dissertation on Babrius (1776) and an edition of Aristotle's *Poetics* (posthumous, 1794).

TYTLER, tĭt′lẽr, Alexander Fraser (1747-1813). A Scotch historical writer, and a judge of the Court of Session in Scotland under the title of Lord Woodhouselee. He was born in Edinburgh, where he was educated. In 1770 he was called to the Scottish bar. In 1780 he became professor of history in the University of Edinburgh; in 1790, judge-advocate of Scotland; and in 1802 he was raised to the bench of the Court of Session. His writings include a biography of Henry Home, Lord Kames (1807); *The Decisions of the Court of Session;* and the work by which he was long known, *Elements of General History* (1801).

TYTLER, Patrick Fraser (1791-1849). A Scotch historical writer, born in Edinburgh, the fourth son of Alexander Fraser Tytler, Lord Woodhouselee. He was educated partly in Edinburgh, partly in England, and was called to the Scottish bar in 1813. Three years later he was appointed King's counsel, but devoted himself chiefly to the production of various literary and historical works, the most valuable of which is his *History of Scotland* (1828-43), beginning at the accession of Alexander III. and terminating at the union of the crowns—a book of more original research than any preceding work on the same subject. His writings also include *Life of James Crichton of Cluny, commonly called the Admirable Crichton* (1819); *Life and Writings of Sir Thomas Craig of Riccarton* (1823); *Life of John Wicliff* (1826); *Lives of Scottish Worthies* (1831-33); *Historical View of the Progress of Discovery on the More Northern Coasts of America* (1832); *Life of Sir Walter Raleigh* (1833); *Life of King Henry VIII.* (1837); and *England Under the Reigns of Edward VI. and Mary*, with the contemporary history of Europe (1839). In consideration of his merits as an historian, Sir Robert Peel's Government conferred on him a pension of £200 a year. Consult Burgon, *Life of Patrick Fraser Tytler* (London, 1859).

TYUMEN, tyōō-män′y′. A town in Siberia. See Tiumen.

TZANA, tsä′nȧ, **TANA,** or **DEMBEA.** A lake in Abyssinia, situated between 11° 35′ and 12° 16′ north latitude, at a height of nearly 6000 feet, and occupying an area of 1150 square miles (Map: Africa, H 3). It is surrounded by volcanic mountains, and receives over thirty affluents, and discharges its waters through the Blue Nile. It contains a number of inhabited islets.

TZENTAL, tsĕn′täl. An ancient cultured nation of Mayan stock, occupying a large part of the States of Tabasco and Northern Chiapas, in Mexico. Their traditional culture hero was Votan, who was said to have built the great ruins at Palenque (q.v.), in Chiapas, and their general civilization resembled that of the Maya and other cognate tribes. They still constitute an important part of the population of their ancient territory.

TZETZES, tsĕt′sēz, Johannes (Lat., from Gk. 'Ιωάννης Τζετζης) (twelfth century A.D.). A Byzantine author and grammarian, who devoted himself to classical Greek literature. He was author of a large number of works, both prose and verse, which are excessively dull and show not a trace of literary genius, but have considerable value as sources of classical information not available elsewhere. His principal writings are his poems *Iliaca*, which included the *Ante-Homerica*, *Homerica*, and *Post-Homerica*, and dealt with the entire Trojan tradition, and are best edited by Bekker (Berlin, 1816). His *Chiliades*, his most comprehensive work, is a didactic poem in 12,674 verses, which is divided into sixty chapters, treating of mythological, literary, and historical miscellanies. This huge work was provided by its author with explanatory scholia; it was edited by Kiessling (Leipzig, 1826). Other works of his are: a collection of 107 letters, his Scholia to Hesiod, Aristophanes, Lycophron's *Alexandra*, Oppian's *Halieutica*, and many other works of minor importance. His elder brother, Isaak Tzetzes, was probably associated with him in preparing certain of his commentaries, and devoted himself particularly to the study of metric. There is extant a long poem on the Metres of Pindar, which is edited by Cramer in his *Anecdota Parisina*, vol. i. (1839).

TZINTZUNZÁN, chĭn′chōōn-chän. A town of the State of Michoacán, Mexico, 32 miles west of Morelia, on Lake Patzcuaro. It is celebrated for its church containing a painting supposed to be an Entombment, by Titian, which is worshiped by the people.

TZONECA. See CHONEK.

TZSCHIRNER, chēr′nĕr, HEINRICH GOTTLIEB (1778-1828). A German Protestant theologian. He was born at Mittweida, Saxony; studied theology at Leipzig; became professor of theology at Wittenberg in 1805; at Leipzig in 1809; and prebendary of Meissen in 1818. He published *Protestantismus und Katholicismus aus dem Standpunkt der Politik betrachtet* (1822; 4th ed. 1824); *Das Reaktionssystem* (1824); and *Der Fall des Heidentums* (ed. by Niedner, 1829).

U

U The twenty-first letter of the English alphabet. The Phœnician alphabet ended with *t* (q.v.) and *u* was the first of the letters developed in Greek and added to its alphabet to supply the deficiency of the Phœnician. Originally U was the uncial and cursive form, and V the capital form. The two were differentiated about the fifteenth century A.D., when V was limited to representing the consonant sound. Before the fifteenth century small *v* and *u* were used interchangeably. In English *u* represents a variety of sounds besides its original value, which is that of a rounded back vowel, the *u* in *rude*. It stands also for the sound *yoo*, as *educate*, *mule*, *value*. It is pronounced like *oo in rule*, *ruby*, *ruin;* ŏŏ in *full*, *pull*, *push;* ə in *Turk*, *turnip*, *turpentine*, *urge;* ŭ (unrounded) in *tub*, *up*, *muff*. A *u* is always written after *q* (q.v.). In this case it has the consonantal value of *w*, which it has also often after other consonants, especially *g* and *s*, as in *quick*, *quartz*, *quote; language*, *anguish*, *guava; suave*, *dissuade*. It is silent in *guard*, *tongue*, *build*, etc.

The sources of *u* are as follows: Anglo-Saxon ŭ, as *sun* from *sunne; begun* from *begunnen; nut* from *hnutu;* Anglo-Saxon ū, as *us* from *ūs; but* from *būtan; up* from *ūp;* Anglo-Saxon ō, as *must* from *mōste*.

In chemistry U stands for *uranium*.

UAKARI, wȧ-kä′rē. See Ouakari.

UARAYCU, wȧ-rī′ko͞o. A peculiar tribe on the Lower Jurua and Jutay rivers, and the adjacent portion of the Amazon, Western Brazil. They whip their youths to test their manhood, and try the fortitude of their maidens by hanging them up in a net over a smoking fire, where they are kept without food until unable to endure any longer. Girls are betrothed in childhood and the young man must hunt game for his bride long before he is permitted to marry her. They burn their dead and bury the ashes in their huts.

UARDA, o͞o-är′dȧ. The second of the Egyptian historical novels by Georg Ebers (1877). The action takes place in Egypt during the reign of Rameses II., and it gives a masterly picture of Egyptian life of that period.

UAUPÉ, wȧ′o͞o-pā′. An extensive group of tribes, probably remotely of Arawakan stock (q.v.), residing on the Uaupés River, a headstream of the Rio Negro, in Southeastern Colombia. They derive their name from a small water bird with a smooth and glistening forehead, in allusion to their habit of rubbing the face with certain leaves to render it smooth and shining. They cultivate corn, tobacco, manioc, cane, and bananas, are experts with the bow, lance, and blowgun, and are great fishermen. They live in large communal houses, sometimes nearly 100 feet square, with a roof nearly 40 feet high supported by columns hewn from the trunks of trees. They make hammocks, pottery, and baskets, and use canoes hollowed out from tree trunks. The men wear the G-string, feather head-dresses, and amulets of white quartz suspended from the neck. The women go entirely naked. Those of the same clan are not allowed to intermarry. Each communal household has its hereditary chief. In physique they are tall, stout, and well made, and are reputed to be among the most industrious tribes of the Amazon region.

UAUPÉS, wä′o͞o-pās′. A large tributary of the Rio Negro, considered by some geographers as the true head-stream of that river (Map: Brazil, D 3). It rises in the Eastern Cordillera of the Colombian Andes, descends from the highlands in a series of falls and rapids, and flows southeastward to its confluence with the main stream in Northwestern Brazil. It is over 700 miles long, and navigable in its lower course over the plains.

UBALDINI, o͞o′bȧl-dē′nē, Petruccio (1524?-1600?). An Italian illuminator and scholar of Tuscan birth. He went to England in 1545, and in the reign of Edward VI. fought in the Scottish wars. At this period of his life he wrote *Relatione delle cose del regno d'Inghilterra* (1551), wherein he records his experiences of English manners and institutions. In 1580 he visited Ireland and compiled an account of the unsuccessful Spanish-Italian invasion of Kerry. His *Vita di Karlo Magno Imperatore* (1581) was the first Italian book printed in England.

UBANGI, ū-băn′gĭ. A river of Central Africa, the largest northern tributary of the Congo (Map: Congo Free State, C 2). It is known also as the Mobangi (near its mouth), the Dua (19° to 20° E.), the Koyu (21° to 22° E.), and the Makua and Welle (in its upper course). The river, probably rising in about 3° N. and 28° E., touches a point about 5° 10′ N. and 19° 40′ E., here turns south, soon forming the Zongo rapids, and finally joins the Congo in about 0° 30′ S. and 17° 50′ E. after a course of about 1500 miles.

From its mouth to its confluence with the Mbomu at Yakoma, about 22° 40′ E., the Ubangi forms the boundary between French Congo and the Congo Free State. That part of the river known as the Welle was first discovered by Schweinfurth in 1870; some ten years later Junker explored the Makua; in 1884 Hanssens discovered the mouth of the Mobangi; in 1885-86 Grenfell went up as far as the Zongo rapids, and within half a dozen years the several parts of the river already discovered were identified as the Ubangi. In great part the river flows through a populous country. Ubangi is also the name of a district in the northwestern part of the Congo Free State.

UBASTET. An Egyptian goddess, called also Pasht or Pakht and, from the Greek form of the name of the city where she was especially worshipped, Bubastis or Bast. She was the wife of Ptah (see MEMPHIS), and was identified by the Greeks with Artemis (see DIANA). Her son was Tum, the solar deity of the western horizon. Beside her main seat of worship at Bubastis (q.v.) she was honored at Thebes (q.v.) and together with Ptah, at Memphis. Ubastet is usually represented as a woman with a cat's head, but in the earlier monuments she more frequently has the head of a lion. Her annual festival, held at Bubastis, was characterized by revelry which implies by its phallic accompaniments a fertility-concept in the nature of the goddess. The cult of Ubastet does not appear to have been very ancient, but from the reign of Rameses III. (q.v.), in the thirteenth century B.C., it became one of the most important in Egypt. See BUBASTIS, and for illustration see *Pakht* in the plate of EGYPTIAN DEITIES in the article EGYPT.

UBEDA, ōō-bä'dȧ. A Spanish town of the Province of Jaén, in Andalusia, in the midst of the fertile Loma de Ubeda. It is 74 miles east of Cordova (Map: Spain, D 3). The country abounds in vineyards, olive plantations, and pasturages devoted especially to the rearing of horses. The town contains a castle with more than twenty towers, the sixteenth-century Church of San Salvador, and the Gothic San Pablo and San Nicolas of lesser note, together with the Palacio de las Cadenas, in which are the municipal offices and the edifice of the Colegio de Escolapius. The streets are broad and well paved and with the plazas well kept. The chief manufactures are pottery, leather, soap, and woolens. The population in 1900 was 19,395.

UBERTI, ōō-bĕr'tê, FAZIO DEGLI (c.1310-c.1370?). An Italian poet, born probably in Pisa. His love lyrics show the influence of Petrarch. His political verse is strongly Ghibelline in sentiment and bitter against the Papacy. His most noted work is the unfinished didactic poem entitled *Dittamondo* (i.e. *dicta mundi*, or things worthy of note in the world), which in its methods imitates the *Divina Commedia* of Dante. Like Dante, converted to righteousness in the middle of the path of life, Fazio feigns himself guided on a fantastic journey by the ancient geographer Solinus, from whose work he borrows largely. He traverses nearly all the known world save Asia, and in connection with all that he imagines himself as seeing he narrates fables, traditions, and legends which imitate, but poorly, episodes of Dante's poem.

Consult the first edition of the *Dittamondo* (Vicenza, 1474) and that of Monti and Perticard (Milan, 1826); an edition of the *Liriche edite e inedite* (Florence, 1883) was prepared by Renier. A commentary on the *Dittamondo* by G. Cappello (1437) remains unedited.

UBIQUIST (from Lat. *ubique*, everywhere). A plant which grows in practically all habitats. The common dandelion, which grows naturally in light or shaded, moist or dry conditions, may be regarded as a typical example. The term cosmopolite refers to existence in all climates rather than all habitats.

UBIQUITY (from Lat. *ubique*, everywhere, from *ubi*, where). A term applied in theology to the doctrine that the Lord's body, in consequence of its personal union with the divine, by a 'communication of properties,' is everywhere present. This use of the word has its origin in the teachings of Luther, who, to defend the real presence of the entire Christ in, with, and under the elements of the Lord's Supper, taught consistently that Christ's body could be everywhere, although he called this presence 'illocal.'

UCAYALE or **UCAYALI,** ōō'kī-ä'lê. A large river of Peru (Map: Peru, C 5). It is one of the main headstreams of the Amazon, and, judged by length and volume, it should be considered as the true upper course of that river. It is formed by the junction of the Apurimac (q.v.), or Tambo, and the Quillabamba at the eastern base of the Andes on the boundary between the departments of Junin and Cuzco, and flows northward in a much winding course till it joins the Marañón in the northeastern corner of Peru to form the Amazon. The length of the Ucayale proper is about 1000 miles, and with the Apurimac the total length is nearly 1500 miles. Some of their sources are near Lake Titicaca, while that of the Mantaro, a tributary of the Apurimac, is in Lake Chinchaycocha or Junin (q.v.) within 100 miles of Lima, on the Pacific coast, and over 13,000 feet above the sea. So rapid is their flow, however, that at their confluence the Ucayale proper is less than 1000 feet above sea level. From this point its course through the densely forested and sparsely populated montaño is very sluggish, falling only 500 feet in nearly 1000 miles. Its banks are here very low, and it divides repeatedly into side channels, while large adjacent areas are periodically submerged. The Ucayale is navigable for the largest vessels, maintaining a depth of 40 to 70 feet for over 600 miles. Steamers can also ascend the Pachitea, the principal tributary below the confluence of the headstreams, over 200 miles to a point about 300 miles from Lima and 3600 miles from the mouth of the Amazon. The Ucayale thus affords an easy means of communication between the Atlantic Ocean and the heart of Peru.

UCCELLO, ōō-chĕl'lô, or **UCCELLI,** PAOLO (c.1397-c.1475). A Florentine painter of the Renaissance, the first of the naturalists. He was properly Paolo di Dono by name, but was called Uccello on account of his fondness for birds. He was a pupil of Ghiberti and was also influenced by Donatello and by Domenico Veneziano. Under Manetti he acquired the facility in perspective which became the main feature of his work. His rare paintings are found chiefly in

Florence, where he frescoed scenes from Genesis in Santa Maria Novella (1446-48). There is also in the Uffizi a battle scene, one of four painted for the Bartolini. In Paris there are portraits by him of Brunelleschi, Donatello, Giotto, Manetti, and himself. In the Metropolitan Museum of New York City there is a portrait of a lady, attributed to him.

UCHARD, ụ'shär', MARIO (1824-93). A French playwright and novelist, born in Paris. After following for some time the business of a stockbroker, he married in 1853 Madeleine Brohan (q.v.) of the Théâtre Français, where he produced the drama *La Fiammina* (1857), which was very successful. His other plays attracted much less attention, but his novels won much favor. They include: *Raymond* (1861); *Le mariage de Gertrude* (1862); *La comtesse Diane* (1864); *Une dernière passion* (1866); *Mon oncle Barbasson* (1876); *Inès Parker* (1880); *Antoinette ma cousine* (1891); and others.

UCHATIUS, ōōg-ä'tsē-ōōs, FRANZ, Baron (1811-81). An Austrian general of artillery and inventor, born at Theresienfeld. Entering the Second Regiment of artillery in 1829, he became commandant of the ordnance works in the arsenal at Vienna in 1871, was made a major-general in 1874, and lieutenant-fieldmarshal in 1879. He introduced an improved process of manufacturing steel in 1856, constructed several ballistic apparatus, especially one for measuring the pressure of gas in gun-barrels, invented the so-called steel-bronze (Uchatius metal), now exclusively used for the equipment of the Austro-Hungarian field-artillery, and in 1875 constructed the ring-grenades, adopted since then by nearly all artilleries. He died by his own hand, in Vienna.

U'CHEE, or **YUCHI**. An interesting tribe, constituting a distinct linguistic stock, formerly centring on the middle Savannah River, in Georgia and South Carolina, but afterwards incorporated with the Creek confederacy. Very little is known of them as a distinct people, but all the evidence tends to substantiate their own claim that they were the autochthones of eastern Georgia and the adjacent region, antedating its occupation by the Muskhogean tribes (see MUSKHOGEAN STOCK) by many years. They call themselves children of the sun, which, according to one of their sacred myths, was their mother, and was worshiped with elaborate ceremonies. In 1739 Governor Oglethorpe concluded a treaty with the Uchee at what was then their principal town, situated on the Savannah River about 30 miles above Savannah. Before the end of the century they had all removed to the Creek country, where in 1799 they had four towns with about 250 warriors, or, perhaps, 800 souls. Their main town was on the western (Alabama) side of the Chattahoochee, a few miles below the present Columbus. They participated in the treaties, wars, and reverses of their Creek allies, and removed with them in 1835 to the Indian Territory, where they still constitute a distinct town, the largest in the Creek Nation. In physique they are smaller than the Creeks, but more wiry and athletic, as well as extremely pugnacious. Their language is remarkable for the number of arrested sounds, which give their conversation a jerky effect. The older ones adhere to their ancient religion and are greatly under the influence of their priests.

UCHTOMSKY, ụk-tôm'skē, ESPER ESPEROVITCH, Prince (1861—). A Russian author and poet, born near Oranienbaum, of an old princely race descended from Rurik. Frequenting the University of Saint Petersburg, he gave his attention chiefly to philosophy and literature and in 1884 was appointed to a position in the Ministry of the Interior. He made three journeys to the East, the last in 1890-91, accompanying the present Czar, then heir apparent, which he described in *Oriental Trip of the Grand Duke Nicholas Alexandrovitch of Russia* (1893-97), a splendidly illustrated work, published also in English, French, and German. Besides many lyric poems, he contributed book-reviews and critical and historical essays to various periodicals, and in 1896 assumed the editorship of the *Sanktpeterburgskija Viedomosti*, in which he advocates particularly an energetic policy of Russia in Eastern Asia.

UDAIPUR, ōō'dī-pōōr', or **ODEYPORE**, called also MEWAR, or MEYWAR. A native State of India, under British protection, in Rajputana (Map: India, B 4). Area, 12,861 square miles. Population, in 1891, 1,844,360; in 1901, 1,021,664. The capital, Udaipur, situated 120 miles southeast of Jodhpore at an altitude of 2064 feet, had 45,595 inhabitants in 1901. Here is an imposing royal palace of marble and granite. Just south of the city is the fortified hill Eklingarh. The roads leading to the city are guarded by a series of fortresses, but these have fallen into a state of decay.

UDALL, ū'dal, NICHOLAS (1505-56). An English schoolmaster and playwright. He was born in Hampshire. In 1524 he was graduated from Corpus Christi College, Oxford, and elected a fellow. He took an early and active part in the Reformation, but he trimmed his sails in the reign of Mary. From 1534 to 1541 he was head master of Eton, and from 1554 to 1556 head master of Westminster School. The fame of his various translations, pamphlets, and Latin and English verse has been eclipsed by his *Ralph Roister Doister*, an English comedy on the Roman model. It seems to have been composed for the boys at Eton before 1551, though, so far as is known, it was not published until 1566. It is the earliest English comedy now extant. Consult the reprint by E. A. Arber (London, 1869); and A. W. Ward's *English Dramatic Literature* (vol. i., rev. ed., ib., 1899). See GAMMER GURTON'S NEEDLE.

UDAL RIGHT. Under the old Scotch law, a species of freehold interest or title to land, independent of the ordinary feudal dues, and corresponding somewhat to an allodial title to real property in England. It was not acquired by a charter or deed, but by continuous possession for a long number of years, which fact could be established by the testimony of witnesses.

UDDEVALLA, ōōd'de-väl'lȧ. A port of Sweden, situated at the head of the Byfjord, 48 miles north of Göteborg (Map: Sweden, D 7). It has a school of navigation, and manufactures cotton goods and furniture. There are also sugar refineries, wood-pulp mills, and granite quarries. Population, in 1901, 9442.

UDINE, ŏŏ'dê-nä. The capital of the Province of Udine, Italy, in a fertile, highly cultivated plain on the Roja Canal, 84 miles by rail northeast of Venice (Map: Italy, H 1). It consists of an inner and an outer town separated by fortifications. The streets are crooked and narrow, but it is an agreeable city. In the centre of the town rises a hill crowned by a castle, now used as a barracks, dating from 1517. The chief square lies at the southern base of the hill. The imposing municipal palace, in the style of the Doges' Palace of Venice, contains a large marble statue of Ajax, and some excellent mural paintings. The Romanesque cathedral possesses a finely sculptured portal. Udine has a handsome theatre, a splendid archiepiscopal palace with historic memories, a school of industrial arts, and a technical institute. There is a small public garden, and the artistic house of the painter Giovanni da Udine is shown. In the Palazzo Bartolini there are a municipal museum of antiquities, paintings by Giovanni da Udine, and a library of over 27,000 volumes. Udine has one of the most unique and beautiful countries in the world. The city manufactures silks, velvets, leather, metal-ware, paper, and sugar. The chief trade is in flax and hemp. Population (commune), in 1881, 32,020; in 1901, 37,942.

Udine, the ancient Utina, was an important city in the Middle Ages. In the thirteenth century it became the capital of Friuli. In 1420 it passed to Venice. Near Udine is the small but interesting town of Cividale del Friuli (q.v.), the ancient Forum Julii.

UDINE, Giovanni da (c.1485-1564). An Italian painter, born at Udine. He was the pupil of Giorgione in Venice and of Raphael in Rome. The latter he assisted in decorating the *loggie* of the Vatican. The arabesques and borders of conventional design are almost entirely the work of Giovanni. His work is principally in Rome. It includes the garlands which surround the "History of Cupid and Psyche" in the Farnesina (designed by Raphael), decorations of painting and stucco in the Palazzo Madama, decorations in Clement VII.'s Torre di Borgia and in the Palazzo Massimi alle Colonne. Of the easel pictures atributed to him, the only authentic one is a "Madonna Enthroned" (1517) in Bergamo (Frizzoni collection).

UEBERWEG, ṳ'bẽr-väG, Friedrich (1826-71). A German philosopher, born at Leichlingen, Prussia. He was educated at Göttingen and Berlin, and in 1862 was made professor of philosophy at Königsberg, where he remained till his death. His most important works are his *System der Logik und Geschichte der logischen Lehren* (1857; 5th ed. 1882; Eng. trans. of the 3d ed. by Lindsay, London, 1871), and his *Grundriss der Geschichte der Philosophie* (1863-66; 8th ed., rev. by M. Heinze, 1894-98; Eng. trans. of the 4th ed. by Morris, New York, 1871). Consult F. A. Lange, *Friedrich Ueberweg* (Berlin, 1871); M. Brasch, *Die Welt- und Lebensanschauung Friedrich Ueberwegs nebst einer biographisch-historischen Einleitung* (Leipzig, 1889).

UECHTRITZ, ṳK'trĭts, Friedrich von (1800-75). A German dramatic poet and novelist, born at Görlitz, Silesia. He studied jurisprudence at Leipzig and held various judicial positions at Treves and Düsseldorf. Of several tragedies, *Alexander and Darius* (1827), with a preface by Tieck, was produced in Dresden, Berlin, and Vienna. *Das Ehrenschwert* also met with a favorable reception. The dramatic poem *Die Babylonier in Jerusalem* (1836), while little adapted to the stage, is distinguished by brilliant diction. His best known novels are *Der Bruder der Braut* (1860), a religious-patriotic tale, and *Eleazar* (1867), a romance of the great Judean war. He also published *Blicke in das Düsseldorfer Kunst- und Künstlerleben* (1839-42). Consult *Erinnerungen an Friedrich von Uechtritz und seine Zeit in Briefen von ihm und an ihn* (Leipzig, 1884), with a preface by Sybel.

UECHTRITZ, Kuno von (1856—). A German sculptor, born at Breslau. He studied at the Vienna Academy under Tilgner, to whose influence is to be attributed his fondness for the Baroque and Rococo style, manifest in his early portrait busts. Subsequently he turned to polychrome work, carrying it from softer tints to thoroughly naturalistic treatment, of which an "Italian Pifferaro with His Monkey," in the National Gallery, Berlin, is an example. After his removal to Berlin in 1886 he took up decorative and monumental sculpture, earning reputation with several fountain designs, enlivened by mythological ideal, and genre figures, and animals, and displaying a subtle sense of humor. For the Siegesallee he executed the group with the statue of Elector George William (1899), and for Breslau the Moltke Monument, with the Norse goddess of Victory offering the laurel to Moltke.

UFA, ōō'fä. A government of Eastern Russia. Area, 47,130 square miles (Map: Russia, J 3). The eastern portion has a mountainous surface, being traversed by offshoots of the Ural Mountains, running in densely wooded ridges parallel to the main mass. The western part has a steppe-like appearance with an incline toward the Kama. This river forms the western boundary line of the government and its navigable tributary, the Byelaya, intersects it in a direction from southeast to northwest. The climate is severe, but very healthful. Ufa is a highly mineralized region containing deposits of iron, copper, coal, petroleum, sulphur, etc. The mining industries, however, are as yet little developed. Agriculture employs only a part of the population, as the inhabitants are largely nomadic and engaged in stock-breeding. About 35 per cent. of the area is under cultivation, chiefly under rye, oats, and wheat. The holdings are generally large, and the use of improved machinery is on the increase. A very important dairy product is kumiss. The manufacturing industries are connected to a large extent with mining, and the chief iron and steel works are situated at Zlatoust (q.v.). Other manufactures are spirits, leather, soap, and candles. The population in 1900 was estimated at 2,420,652, of whom the Russians constituted about 45 per cent., the remainder consisting of Bashkirs, Tatars, and Meshtcheryaks.

UFA. The capital of the Government of Ufa, in Eastern Russia, situated on the Byelaya, near its junction with the Ufa, 326 miles by rail east-northeast of Samara (Map: Russia, J 4). Population, in 1897, 49,961.

UFFIZI, Palazzo Degli. A celebrated Florentine palace, containing one of the finest collections of sculpture and painting in the world. It was erected in 1560-76, after the designs of Giorgio Vasari for the Government offices of the Grand Duchy of Tuscany. The ground story is one of the most beautiful open halls of Italy; it is roofed with barrel vaulting supported by heavy Doric pillars which extend the height of the entire façade. The top story, now containing the gallery, was originally an open loggia. In the vestibule and court are many statues of celebrated Tuscans.

The nucleus of the gallery was a part of the celebrated collections made by the Medici in the fifteenth century. Additions were acquired or inherited by many of the Medicean dukes, and the collection was bequeathed to the State by the last representative of the line in 1737. It is especially rich in antique statuary, possessing the celebrated Niobid group, the "Boy Drawing Out a Thorn," the "Apollino," the "Medicæan Venus," "Satyr," "Wrestlers," the "Grinder," and "Dying Alexander." The collection of paintings possesses numerous works by artists of the early Florentine Renaissance, such as Fra Angelico, Filippo and Filippino Lippi, Domenico Ghirlandajo, and especially Sandro Botticelli. The High Renaissance is well represented by Michelangelo, Fra Bartolommeo, Andrea del Sarto, Raphael, Giorgione, Titian, and Correggio, the gallery being especially rich in masterpieces of Titian and Raphael. There is also a fine collection of Flemish and Dutch masters. The celebrated "Tribuna" of the Uffizi is a small room containing many of the masterpieces of painting and sculpture. An interesting feature of the gallery is a unique collection of portraits of great masters by themselves. A passageway connects the Uffizi with the Pitti Collection. (See Pitti Palace.) The second story of the Uffizi contains the Biblioteca Nationale, containing 300,000 volumes and 14,000 manuscripts. Its nucleus was the Maglialecchiana Collection, to which, in 1862, was added the Royal Library of the Pitti Palace. The Uffizi also houses the Florentine State archives, one of the richest collections of documents in the world.

UGANDA (ōō-gän'dȧ) **PROTECTORATE.** A British protectorate in British East Africa, consisting of the native kingdom of Uganda and several adjacent States. It is bounded by the parallel of 5° north latitude (Egyptian Sudan) on the north, the Congo Free State on the west, and the German East African frontier (in part following the parallel of 1° south latitude) on the south (Map: Congo Free State, F 3). The eastern boundary is marked by a line drawn through the middle of Lake Rudolf, and by what is known as the Eastern Province. The protectorate covers 80,000 square miles (estimated).

Uganda is very mountainous, its mean altitude being given as over 3000 feet. It is a remarkably diversified country, with snow peaks, elevated plains, vast forests, and low swamps; and it also embraces the very arid depression around Lake Rudolf. The variety of climate it offers is likewise exceptionally great. The Lake Rudolf region has an average altitude of 2000 feet, is tropically hot, and is the most barren and hopeless section. The Mount Elgon region and that north of the Victoria Nyanza are much more favorable to development, owing to the ample rainfall and well-watered conditions. But the climate here is generally damp, hot, and productive of malarial fevers. This region, westward of the extinct volcano Mount Elgon—a gigantic mass 14,000 feet high, with a crater several miles wide—has an average elevation of some 4000 feet, and possesses dense forests, marshes, and many good agricultural districts. The course of the Nile from the Ripon Falls (its exit from the Victoria Nyanza) to Lado is within or contiguous to this region. The western part of the protectorate, distinguished by the Albert and Albert Edward lakes, the magnificent snowy Ruwenzori (thought to exceed 16,000 feet in elevation), and the deep-forested valley of the Semliki, forms a remarkable region rich in possibilities. Splendid plateaus and charming small lakes here abound. Cooling breezes make Ankori and Toro not only habitable, but inviting. In the Nile Valley to the north the heat is extreme, the rainfall abundant. The northern part of the protectorate is generally forbidding. The waters of the many lakes which characterize the protectorate are partly fresh and partly salt. Kioga-Kwania and Deveru may be mentioned in addition to the lakes already named.

Except in the Rudolf district, the flora, which is in general kindred to that of West Africa, is rich and abundant, but there is no oil palm. Papyrus covers the swampy Nile Valley. The lofty mountains explain the presence of the alpine vegetation in the higher parts, and of the witch-hazel and trees of kindred classes on the plateaus. Uganda has a peculiar long grass, from 10 to 15 feet high, which is used for building purposes by the natives. The fauna is allied to that of equatorial Central Africa and the Congo Basin, in conformity with the moist and forested character of the region. A list of the birds and quadrupeds would include most of those of Africa which are not strictly desert or seacoast forms. Lions and leopards are numerous, living upon antelopes and wild and tame cattle; and the rivers and lakes abound in crocodiles, feeding upon the fish, many of which are wholesome for food. There are no anthropoid apes, but many monkeys, of which the guerza is most notable. Large collections of insects and land shells have been made, but much remains to be learned of the smaller life of the region.

In the eastern sections of the protectorate granite and gneiss are prominent; in the central regions, quartz, sandstone, and basalt are added; around Lake Rudolf lava and tuff are superimposed on the foregoing formations. Iron ore abounds. Gold has been discovered in the north, and there are promising indications that many varieties of precious stones and metals will be found. The soil is of great fertility. Coffee of an excellent kind is indigenous, and much of it is being cultivated. Not a little has been done toward improving the country by building substantial houses, making good roads, etc. Rubber, ivory, and hides are the leading articles of trade. The commerce is chiefly in the hands of Germans, British Indians, and native dealers, and is slowly developing. The total value in 1901-02 was about £550,000, £50,000 being exports. Steamers ply between the northern boundary and Khartum. The so-called Uganda Railway lies wholly within the British East Africa Protectorate (q.v.).

The administration is left largely by Great Britain to the native chiefs. The British Government is represented by a commissioner and a deputy commissioner. The colonial forces, numbering 4,000 men, are commanded and largely officered by Englishmen. The headquarters of the English administration are at Entebbe. The government of the kingdom of Uganda, the chief state of the protectorate, is a feudal and hereditary monarchy. The native King's parliament is called 'Lukiko;' the capital is Mengo. The kings of Toro, Unyoro, and Ankole possess similar though less important honors and privileges. The protectorate is divided into five provinces, which are subdivided into districts or counties. There are British consular courts for the settlement of disputes between Europeans and natives. The local revenue of the protectorate in 1903 was estimated at about $200,000; the expenditure, at $670,000. Great Britain makes up the deficits. The population is estimated to be about 4,000,000. There are less than 500 Europeans.

The natives of the protectorate may be classified as Negritos or Pygmies, Bantus (q.v.), Nilotic Negroes, Hamites, and Masai (q.v.), though most of them are probably mixtures in varying degree of these different types. The Pygmies are not numerous, a few being found in that part of the Congo forest which is included within the limits of the protectorate. The Bantus, who in general are an agricultural people, make up nearly half the population. The Hamites are represented by a few tribes in the islands and on the north shore of Lake Rudolf and by the pastoral Wa-Huma or Bahima, probably of Galla ancestry (see Gallas), who more than 100 years ago conquered the Bantu agriculturists, and at present, more or less mixed with Bantu blood, form the aristocracy and ruling classes. They are purest in the western part of the protectorate, where there are also a few separate Bahima tribes. The Masai are met with in the Rudolf region, the Suk and Turkana tribes being good representatives. The Nilotic Negroes occupy the Nile Province and a large part of the Central Province, reaching the Victoria Nyanza in Kavirondo. Negro tribes also extend southward along the Albert Nyanza, especially on the west side, the Semliki River, and the Albert Edward Nyanza to the extreme southwest corner of the protectorate.

The Uganda Protectorate was formed initially of the once powerful native kingdom of Uganda, which has been in the British sphere of influence since 1890. The protectorate dates from 1894. The region was first visited by a European (Captain Speke) in 1862. Stanley passed through Uganda in 1875.

Bibliography. Speke, *Journal of the Discovery of the Source of the Nile* (Edinburgh, 1863); Taylor, *The Lake Regions of Central Africa* (New York, 1875); Reclus, *Géographie universelle*, vol. xiii. (Paris, 1888); Stanley, *In Darkest Africa* (New York, 1890); Richter, *Uganda* (Gütersloh, 1893); Kollmann, *The Victoria Nyanza* (London, 1900); Scott-Elliott, *A Naturalist in Mid Africa* (ib., 1896); Johnston, *The Uganda Protectorate* (ib., 1902); Ansorge, *Under the African Sun* (London, 1899); Ashe, *Two Kings of Uganda* (2d ed., ib., 1897); Colville, *The Land of the Nile Springs* (ib., 1895); Lugard, *The Story of Uganda* (ib., 1900); Purvis, *Handbook of British East Africa and Uganda* (ib., 1900); Wilson and Felkin, *Uganda and the Egyptian Sudan* (ib., 1882).

UGOGO, ū-gō′gō. A district of German East Africa, about 170 miles west of that part of the coast opposite Zanzibar. It is a bare, arid plateau, about 3500 feet in altitude, inhabited by the Gogo, or Wagogo, a warlike Bantu tribe (Map: Congo Free State, G 4).

UGOLINO DA SIENA, ōō′gō-lē′nō dȧ syā′nȧ. A name appearing in the early annals of Sienese painting and once thought from its different designations to apply to four persons. It is probable, however, that the Ugolino da Siena who was influenced by Duccio and Cimabue, and who died at an advanced age in 1339, was identical with Ugolino di Neri and Ugolino di Pietro, mentioned in Sienese records of 1317 and 1324. The only work attributed to him with any degree of probability is part of an altar-piece which was painted for Santa Croce at Florence, two panels of which are now in London. Another Ugolino da Siena, or Ugolino di Prete Ilario, also of the fourteenth century, painted in the Cathedral of Orvieto in 1364 and 1378.

UGRIANS. A term often used to designate a subdivision (closely related to the Finns) of the Ural-Altaic stock, which included the Ostiaks, Voguls, and Magyars. See Ural-Altaic.

UHDE, ōō′d*e*, Fritz von (1848—). A German historical and genre painter, born at Wolkenburg, Saxony. He began his artistic studies at the Dresden Academy in 1866, but, totally at variance with the spirit prevailing there, entered upon a military career and served in the army until 1877, when he took up painting again, at Munich, giving his attention especially to the old Dutch masters. Unsuccessful in his attempts to gain admittance to the studios of either Piloty or Diez, he was induced by Munkácsy in 1879 to remove to Paris, where he worked for a short time in that master's studio, but principally studied from nature and his old Netherland models. A result of these combined influences was the "Family Concert" (1881, Cologne Museum). The new coloristic principles which he in the meanwhile adopted are apparent in the "Arrival of the Organ-Grinder" (1883), and, turning now to religious subjects, he gave full vent to the most uncompromising sobriety in composition in his "Suffer the Little Children to Come unto Me!" (1884, Leipzig Museum). As this scene is depicted as taking place in a poor working man's room, so is also the following subject, "Come, Lord Jesus, and Be Our Guest" (1885, National Gallery, Berlin). He next produced "Christ with the Disciples at Emmaus" (1885, Städel Institute, Frankfort), "The Sermon on the Mount" (1887), the triptych of the "Nativity" (1889, Dresden Gallery), and "The Walk to Bethlehem" (1890, New Pinakothek, Munich), a bold modern conception of the subject. Progressing in his naturalistic conception, Uhde gave rise to a complete change in German art, counting among his followers most of the younger generation. His more recent productions include: "Noli me tangere" (1894, New Pinakothek, Munich), "The Wise Men from the East" (1896, Magdeburg Museum), "The Last Supper" (1897, Stuttgart Museum), "Ascension" (1898, New Pinakothek, Munich), and "Woman, Why Weepest Thou?" (1900, Vienna Museum). Consult the monographs by Lücke (Leipzig, 1887), Graul (Vienna, 1893), Bierbaum (Munich, 1893), Meissner (Berlin, 1900), and Ostini (Bielefeld, 1902).

UHLAND, ōō′länt, LUDWIG (1787-1862). A distinguished German poet, philologist, and literary historian. Born at Tübingen, April 26, 1787, he studied jurisprudence there, in 1802-08, at the same time cultivating mediæval literature, especially old German and French poetry, the study of which he subsequently pursued for eight months in Paris. On his return he began the practice of law at Stuttgart, worked in the Ministry of Justice, and when in 1815 Württemberg was to be granted a new constitution, his lyrics in praise of liberty were received with enthusiasm. As a member of the Legislature from 1819 to 1839 he sided with the opposition. In 1848 he was elected to the German National Assembly, but in 1850 retired from political life and settled at Tübingen, devoting himself henceforth exclusively to his literary pursuits. From 1829 to 1833 he had held the professorship of German literature at the University of Tübingen. As a lyric poet Uhland is remarkable for truth and simplicity of sentiment and his picturesque view of nature. His ballads and romances rank among the most precious ideal treasures of the German nation. During all his early life he labored to revive mediæval forms of poetry, especially the ballad, with an interest born of intimate knowledge and careful study. None has caught the spirit of the old folk-song so fully as he. Of his songs the most universally popular are "Der Wirtin Töchterlein" and "Der gute Kamerad;" of the ballads, "Das Schloss am Meer," "Das Glück von Edenhall," "Des Goldschmieds Töchterlein," "Roland Schildträger," "Der schwarze Ritter," and "Des Sängers Fluch" are in all anthologies. He was the first of the Swabian school of poets who sought to combine a classic purity of style with brevity and vigor, and to interpenetrate all with romantic sentiment. Although poetically effective, his glorifications of German faith, the dramas *Ernst, Herzog von Schwaben* (1817), and *Ludwig der Bayer* (1819) lack the power of dramatic action and had only moderate success. As a Germanic and Romance philologist, Uhland must be counted among the founders of that science. Besides the treatise *Ueber das altfranzösische Epos* (1812) and an essay *Zur Geschichte der Freischiessen* (1828), there are to be especially mentioned *Walther von der Vogelweide, ein altdeutscher Dichter* (1822); *Der Mythus von Thôr* (1836), the result of the most painstaking original investigation; and the masterly collection *Alte hoch-und niederdeutsche Volkslieder* (1844-45; 3d ed. 1892). His poetical works were repeatedly published as *Gedichte und Dramen,* while his scientific work is embodied in *Schriften zur Geschichte der Dichtung und Sage,* edited by Holland, Keller, and Pfeiffer (1865-72). For his biography, consult: Pfeiffer (Vienna, 1862), Notter (Stuttgart, 1863), Jahn (Bonn, 1863), Dederich (Gotha, 1886), Holland (Tübingen, 1886), and Fischer (Stuttgart, 1887); also Mayer, *Ludwig Uhland, seine Freunde und Zeitgenossen* (ib., 1867), and *Ludwig Uhlands Leben. Aus dessen Nachlass und aus eigener Erinnerung zusammengestellt von seiner Wittwe* (ib., 1874).

UHLAND, WILHELM HEINRICH (1840—). A German engineer and writer on technology, born in Nordheim, Württemberg. In 1865 he founded the Technikum Mittweida, the first private institution for the instruction of machinists, and in 1868 organized the Technikum Frankenberg, near Chemnitz. He invented numerous improvements in the manufacture of starch, and contributed other inventions to various industries which have found extensive application throughout the world. He founded and became editor of the periodical *Der praktische Maschinen-Constructeur,* and wrote: *Handbuch für den praktischen Maschinen-Constructeur* (1883); *Skizzenbuch für den praktischen Maschinen-Constructeur* (16 vols., 1867-95); *Die Corliss- und Ventildampfmaschinen* (1879); *Die Telephonanlagen* (1881); *Dampfmaschinen mit Schiebersteuerung* (1881); *Die Woolfschen und Compounddampfmaschinen* (1882); *Die Hebeapparate* (1882-83); *Das elektrische Licht und die elektrische Beleuchtung* (1884); *Die Brotbäckerei, Biskuit- und Teigwarenfabrikation* (1885).

UHLICH, ōō′lĭk, LEBERECHT (1799-1872). One of the founders of the German 'Free Congregations' (q.v.). He was born at Köthen, Anhalt, studied at Halle, and served as pastor in various places till 1847, when he withdrew from the Evangelical Church, and thenceforth was preacher of the Free Congregation at Magdeburg. In 1841 he became the leader of the 'Protestant Friends,' or 'Friends of Light.' His liberal views frequently involved him in difficulties with the authorities. He published *Bekenntnisse* (4th ed. 1846); *Christentum und Kirche* (2d ed. 1846); *Die Throne im Himmel und auf Erden* (1845); *Handbüchlein der freien Religion* (7th ed. 1889). His autobiography appeared at Gera in 1872.

UHRICHSVILLE, ū′rĭks-vĭl. A city in Tuscarawas County, Ohio, 41 miles northwest of Wheeling, W. Va.; on Big Stillwater Creek, and on the Pittsburg, Cincinnati, Chicago and Saint Louis and the Baltimore and Ohio railroads (Map: Ohio, H 5). It derives considerable commercial importance from its situation in a farming and stock-raising section, and has several large sewer-pipe and fire-clay plants. Population, in 1890, 3842; in 1900, 4582.

UIGURS. A people of Eastern Turkestan, and of Turkic stock. They founded the powerful kingdom of Hiong-Nu, which reached its zenith in the first century A.D., when it was divided into a northern and a southern empire. The latter was destroyed by the Tunguses in the third century, whereupon the southern Uigurs retreated to the west and founded the empire of the Huns (q.v.). In the eighth century the northern Uigurs founded a kingdom which was destroyed by the Kirghizes. In the fifth century A.D. their culture, developed on the slopes of the Tian Shan, was in a flourishing condition, and about this time they underwent considerable Buddhistic and Chinese influence, their religion having already been modified to some extent by Nestorian Christians, from whom they adopted the traces of Zoroastrianism also present among them. But they finally adopted the faith of Islam, and have been modified in blood and other characteristics by more recent Mongol-Chinese, Arab, and Turkic elements. The vicissitudes of time have deprived the Uigurs of their independent nationality and much of their peculiar culture. It is probably due to Uigur influence that the Mongols and Manchus adopted the Syrian system of writing, and not a few other advances in the culture of the numerous tribes of Central Asia and Siberia may, perhaps, be attributed to them. Consult: Klaproth, *Abhandlungen über die Sprache und Schrift der Uiguren* (Paris, 1820); Vámbéry, *Uigurische Sprachmonumente und das Kudatku Bilik* (Leipzig, 1870); Schott, *Zur Uigurenfrage* (Berlin, 1875); Radloff, *Aus Sibirien* (Leipzig, 1893); id., *Ethnologische Uebersicht der Türkenstämme Sibiriens und der Mongolei* (ib., 1883); id., *Die alttürkischen Inschriften der Mongolei* (Saint Petersburg, 1899).

UIN′TATHE′RIUM (Neo-Lat., from Eng. *Uintah*, mountain-range in Utah + Gk. *θηρίον*, *thērion*, diminutive of *θήρ*, *thēr*, wild beast). An extinct and blunt-toed (amblypod) ungulate mammal, found fossil in the Eocene fresh-water deposits of the Western United States. The animal was about the size of a rhinoceros, with a large narrow head. The skull of the male is armed with two pairs of bony horn-like protuberances, of which the larger hinder pair is supported by crests of bone that slope upward toward them from points near the orbits. There are also two small knobs on the end of the nose. The upper incisor teeth are absent and the upper canines of the male are enlarged to form drooping recurved tusks. The horns and tusks are less prominently developed in the females. The eyes were small. The brain cavity is small, indicating a ratio between weight of brain and that of body of about 1 to 4000, which is exceptionally low for a mammal.

UIST, wĭst, North and South. Two islands of the Outer Hebrides, situated south of Lewis-with-Harris and 15 to 30 miles west of Skye (Map: Scotland, A 2). They are separated by the smaller island of Benbecula. North Uist is 18 miles long and 3 to 10 miles wide; South Uist is 22 miles long and 7 miles wide. The western parts of both are fertile and productive and the inhabitants engage in agriculture and cattle-raising, as well as fishing. Population, in 1901, of North Uist, 3862; of South Uist, 5515.

UJ-BECSE, o͞o′y′ bĕ′chĕ. A town of Hungary. See Becse.

UJFALVY, o͞o′y′-fȧl-vê, Charles Eugène (1842-1904). An Austrian philologist, anthropologist, and traveler, born in Vienna of an old Hungarian noble family. Educated in the military academy at Wiener-Neustadt, he served as lieutenant in the army until 1864, when he went to study at the University of Bonn. Going to France in 1867, he was appointed professor in the Oriental Academy in 1873, and by order of the French Government undertook three scientific expeditions into Central Asia, in 1876-82, the results of which were published in *Expédition scientifique française en Russie, en Sibérie et dans le Turkestan* (1878-80). Among several ethnological and linguistic essays, there are to be noted: *La langue magyare, son origine*, etc. (1871); *La migration des peuples*, etc. (1873); *Mélanges altaïques* (1874), and others. After 1884 he devoted himself to art-historical researches and published in that line *Les biscuits de porcelaine* (1893).

UJI, o͞o′jê. A well-known suburb of Kioto, Japan, the ancient capital of the Empire. Uji lies on the Uji River where it breaks through the gorge as it issues from Lake Biwa. The pretty village is surrounded by the most ancient and famous tea plantations in Japan. Population, less than 20,000.

UJI (Jap., maggot). The Japanese name for a parasite of the silkworm, a tachinid fly (*Leskia sericaria*). It is said by Sasaki that the eggs of the parasite are laid upon the mulberry leaves and are eaten by the worms, after which the larva hatches out and feeds in the interior of the worms in the same way as do the larvæ of tachina-flies. The life-history is thus very abnormal, since with other species the eggs are laid upon the body of the caterpillar or other host insect. This parasite sometimes does considerable damage in Japan, but fortunately has not been introduced into other silk-raising countries.

UJIJI, o͞o-jē′jê. A town of German East Africa, situated on the eastern shore of Lake Tanganyika (Map: Congo Free State, F 3). It is the terminus of the caravan route from Zanzibar and was formerly an important slave market. Here Stanley found Livingstone in 1871. Population, about 8000.

UJI-YAMADA, o͞o′jê-yä′mȧ-dȧ. A town in the Prefecture of Miye, Central Hondo, Japan, 73 miles by rail south of Nagoya (Map: Japan, E 6). It is filled with inns and hotels for the accommodation of the pilgrims to the near-by Isé shrines. Population, in 1898, 27,990.

UJJAIN, o͞o-jīn′ (Skt. *Ujjayinī*, City of Victory, Gk. Ὀζήνη, *Ozēnē*), or Oojein. A town of Malwa, in the State of Gwalior, Central India, on the right bank of the Sipra, 35 miles north of Indore (Map: India, C 4). It has an active trade in opium, cloth, etc. It is encircled by a wall six miles in circumference, conspicuous on account of its round towers; has a spacious bazaar, a grand palace of the Maharaja Sindhia, several mosques and mausoleums, and an observatory dating from the fifteenth century. Ujjain is said to have been the viceregal seat of Asoka (q.v.) during his father's reign at Patna, but is better known as the capital of the Samvat kingdom founded B.C. 57 by Vikramaditya. (See Vikrama.) It was the capital of Sindhia until the seat of government was removed to Gwalior in 1810. Population, in 1891, 34,691; in 1901, 39,892.

UKASE (Russ. *ukazŭ*, edict, from *ykazatĭ*, to order, indicate, from *y*, in, by, near, connected with Gk. *ἐν*, *en*, Lat. *in*, in + *kazatĭ*, to show, connected with Gk. *τέκμαρ*, *tekmar*, boundary, goal, token, sign, Skt. *cakṣ*, to see), or Ukas. A term applied in Russia to all the orders or edicts, legislative or administrative, emanating from the Government. The ukases either proceed directly from the Emperor, or are published as decisions of the directing senate. In either case they have the force of laws till they are annulled by subsequent decisions. A collection of ukases in 48 volumes was made by order of the Czar Nicholas in 1827, and has been supplemented from time to time. These, after the elimination of such ukases as are unimportant or of temporary authority, constitute the present legal code (*svod*) of the Russian Empire.

UKIO-YÉ, o͞o'kyō-yā' (Jap., pictures of the passing world). The name of the modern popular school of painting in Japan, founded by Hokusai (q.v.) and continued by his pupils and successors. The beginning of the movement may be traced as far back as the end of the sixteenth century, when droll sketches were made by Iwasa. Toward the close of the eighteenth century Okyo painted fowls, fishes, and monkeys, their naturalism giving an immense impulse to the popularization of art. The most common form of Ukio-yé is the *nishiki-yé*, 'brocade pictures,' and it is the art of the common people. Consult: Anderson, *Descriptive and Historical Catalogue of Chinese and Japanese Art* (London, 1886); Brinkley, *Japan; Its History, Arts, and Literature* (Boston, 1901-02).

U'KRAINE. A name formerly applied to a part of the old Kingdom of Poland, comprising portions of the present Russian governments of Podolia, Kiev, Tchernigov, Ekaterinoslav, and Kherson, and the whole of Poltava. By the Treaty of Andrussovo in 1667 the portion to the left of the Dnieper and Kiev passed to Russia, and later became known as Little Russia. The remainder was acquired by Russia at the second partition of Poland in 1793.

ULCER (from Lat. *ulcus*, Gk. ἕλκος, *helkos*, sore, ulcer, wound). An open sore; a superficial solution in the continuity of the soft parts. The tendency of an ulcer is toward continued dissolution of the tissues in which it exists, rather than toward healing, as in the case of an ordinary open granulating wound, the latter being less frequently (though properly) called an ulcer. Ulcers are usually classified according to their character and mode of origin into two classes: simple and specific or infective ulcers. Infective ulcers may result from such infective diseases as syphilis, tubercle, leprosy, and glanders. Among the simple ulcers may be mentioned a number of varieties, such as the *traumatic* or *inflammatory*, the *varicose* or *chronic*, the *erethritic* or *irritable*, the *perforating* or *trophic*, the *callous* or *indolent ulcer*, the *hemorrhagic*, the *phagedenic*, and the *fungous ulcer*.

The structures to which ulceration is usually limited are the skin and mucous membranes. Upon the surface of an ulcer a layer of inflammatory exudate is found, mingled with fragments of broken-down tissue or tissue in a state of coagulative necrosis. Beneath this tissue lies a layer of what is known as granulation tissue, which is composed of polynuclear leucocytes and epithelioid cells, with relatively little intercellular substance, but richly supplied with a network of capillary blood vessels, and forming the base of the ulcer. Below this there is usually found some of the fibrous tissue of the deeper layers of the skin. The edges of the ulcer consist of the surrounding skin, which has been more or less altered by inflammatory changes. The margins of an ulcer are occasionally undermined by the ulcerative process, or they may become firmly adhesive to the periosteum of bone or other subjacent structures. The varicose ulcer, the form most commonly seen by the surgeon, is situated usually on the front of the leg, above its lower third. Around it are generally seen the numerous dilated and congested veins whose condition is responsible for the ulcerative process. Passive hyperæmia and its resultant enfeebled nutrition are the fundamental causes of ulceration in this locality.

The treatment of ulceration in general may be regarded as constitutional and local. Constitutional treatment consists in fresh air, nourishing diet, proper hygienic surroundings, the administration of iron where anæmia exists, and the appropriate medication for any specific constitutional disease that may be present. Local treatment consists in rest and elevation of the part, antiseptic measures, and the application of special local forms of treatment adapted to the conditions present at the site of ulceration. Bandaging, strapping, and the application of various stimulating substances are the measures generally employed. Consult Morris, *How We Treat Wounds To-day* (New York and London, 2d ed., 1886).

ULEÅBORG, o͞o'lå-ô-bôr-y'. The northernmost government of Finland, Russia (Map: Russia, C 1). Area, 63,957 square miles, or 44 per cent. of the area of Finland. The surface is densely wooded and interspersed with lakes and marshes. The climate is very severe. The chief industry is lumbering. There are also some metal works and tanneries. Population, in 1897, 273,290, almost exclusively Finns.

ULEÅBORG. The capital of the Government of Uleåborg, in Finland, Russia, on the Gulf of Bothnia, 498 miles by rail north of Helsingfors (Map: Russia, C 1). The town manufactures leather. Population, in 1898, 15,042.

ULEMA, ṳl'â-mä (Ar. *ulamâ*, plural of *âlim*, learned, from *alima*, to know). The theologian lawyers of Islam. This religion has no ecclesiastical ministry, as any one of the Faithful may lead a congregation in prayer as Imam. But, inasmuch as theoretically every detail of life is to be guided by the letter of the Koran, along with all the approved traditions and orthodox interpretations, there is the necessity of a class of men learned in the canon law, who may act as the advisers of the Faithful in all these innumerable emergencies. These Ulemas, therefore, correspond most closely to the class of the Scribes or Rabbis in Judaism. The province of the Ulemas is now confined to a limited field in the Turkish Empire. By dictating the details of domestic life, they wield a vast authority over the people, and stand independent of, and often opposed to, the secular Government. They are recruited mostly from the lower classes. The candidates go up to the schools or universities, where the scholar remains three or four years, passing successively through the disciplines of grammar, dogma, and law. He may also pursue logic, rhetoric, etc. The great Mohammedan university is that of Cairo. The order is hierarchically graded. Above the lowest class stand the muftis, who have vast power in making abstract decisions on the law; above these the mollahs (i.e. patrons), who constitute the governing body, having their chief centres at Constantinople and Cairo; and from this body at Cairo is appointed the Grand Mufti, or Sheikh-ul-Islam, the chief spiritual authority in Turkey.

ULEX. See FURZE.

ULEXITE (named in honor of G. L. *Ulex*, a German chemist). A hydrated sodium and calcium borate that occurs in rounded masses, consisting of fine fibres. It has a silky lustre, and is white. It is found in Chile, Argentina, and on the West African coast; also in Esmeralda County, Nevada, and at several localities in Inyo, Kern, and San Bernardino counties, California. It is an important source of borax.

ULFELDT, o͞ol'fĕlt, Korfiz, Count (1606-64). A Danish adventurer. Through marriage with Leonora Christina, the natural daughter of King Christian IV., he rose to high office, being made Governor of Copenhagen and royal steward (1643). He retained his influence after the accession of Frederick III., the enmity of whose Queen, however, forced him in 1653 to flee to Sweden. In 1657 he fought against his native country, and by the Treaty of Roeskilde (1658) was restored to his estates. After many vicissitudes he died a fugitive near Basel, February 20, 1664. His wife was kept a prisoner at Copenhagen from 1663 to 1685, and wrote an account of her captivity in *Jammers Minde*, a notable specimen of Danish prose. She died in 1698. Consult Ziegler, *Denkwürdigkeiten der Gräfin Leonora Christina, vermählten Gräfin Ulfeldt* (Vienna, 1879).

UL'FILAS, Gothic **WULFILA** (little wolf) (c.311-c.381). Bishop of the Goths, and translator of the Bible into Gothic. He was born in Dacia. Tradition relates that his ancestors were Cappadocian Christians who had been taken captive by the Goths and had lived many years among them. Early in life he was a *lector* or reader of the Scriptures among his countrymen, and in 341 he was consecrated Bishop of the West Goths by Eusebius of Nicomedia (q.v.) at a Synod at Antioch. He was then and for the remainder of his life an Arian. For seven years he worked with much success as a missionary north of the Danube. In 348 the persecution of a heathen chief induced Ulfilas and his flock to emigrate, and, with the consent of the Emperor Constantine, they settled in Mœsia, in Byzantine territory south of the Danube. For more than thirty years Ulfilas continued his activity as the apostle to the Goths; he died at Constantinople, whither he had been summoned by the Emperor, probably in 381. Ulfilas had a good knowledge of Greek, Latin, and Gothic, and preached and wrote in all three languages. He is remembered chiefly for his translation of the Bible, which marks not only the beginning of Christianity among his people, but of Germanic literature as well. His plan is said to have included the entire Bible with the exception of the Books of Kings, which he thought contained too much about wars for the good of his fierce countrymen. The portions of his work which have been preserved are most of the four Gospels, the Second Epistle to the Corinthians, and other fragments, comprising the greater portion of the New Testament; of the Old Testament, portions of the Books of Nehemiah and Genesis only. The chief manuscript is the so-called *Codex Argenteus*, written with silver letters on purple parchment and now in the library of the University of Upsala. Editions of all the fragments have been published by Von der Gabelenz and Löbe (3 vols., Leipzig, 1843-46); Uppström, *Codex Argenteus*, in facsimile (Upsala, 1854-57); *Fragmenta Gothica Selecta* (ib., 1861); *Codices Gothici Ambrosiani* (Stockholm, 1868); Bernhardt (Halle, 1875); and Heyne (9th ed., Paderborn, 1896). For the life of Ulfilas consult Waitz (Hanover, 1840), Bessell (Göttingen, 1860), and Scott (Cambridge, 1885).

ULLMANN, ụl'män, Karl (1796-1865). A German Protestant theologian. He was born at Epfenbach, Bavaria, and studied theology at Heidelberg and Tübingen. He was appointed professor at Heidelberg in 1821. In connection with Umbreit he established in 1828 the *Theologische Studien und Kritiken*. He was professor at Halle, 1829-36, after which he returned to Heidelberg. He was president of the supreme ecclesiastical council of Baden, 1856-61. His most important works were *Gregor von Nazianz* (1825; 2d ed. 1867); *Die Reformatoren vor der Reformation* (1841; 2d ed. 1866); *Ueber die Sündlosigkeit Jesu* (7th ed. 1863); *Das Wesen des Christenthums* (5th ed. 1865), all of which were translated into English. Consult his *Life* by Beyschlag (Gotha, 1867).

ULLOA, ụl-yō'ȧ, Antonio de (1716-95). A Spanish statesman and scientist, born at Seville. He entered the Spanish navy, and in 1735 accompanied to South America the French scientific expedition sent out to measure a degree of the meridian at the equator. He became rear-admiral in 1760, came to Louisiana as Governor in 1764, and was made lieutenant-general of the naval forces in 1770. He was sent on a secret expedition against Florida, but his zeal as naturalist made him forget his sealed orders and brought him before a court martial (1780). He was acquitted, but lived in retirement. He wrote *Relación histórica del viaje á la América meridional* (1748).

ULLS'WATER. The largest of the English lakes, after Windermere, lying between the counties of Cumberland and Westmoreland, 10 miles east of Keswick (Map: England, D 2). Length, 8½ miles; breadth, ¼ to ¾ mile. Its scenery is rugged and grand, and one of its chief features is Helvellyn, which rises 3118 feet at the southwest extremity.

ULM, ụlm. A city of the Kingdom of Württemberg, Germany, and an important Imperial fortress, situated at the junction of the Iller and the Blau with the Danube, which here becomes navigable, 43 miles west of Augsburg (Map: Germany, C 4). Two bridges unite the city with New Ulm, a village on the Bavarian side of the Danube. The streets are narrow. The minster, which is a Protestant church, is the most important and beautiful example of late Gothic architecture in Germany, and is next to the Cathedral of Cologne the largest church in that country. It is 407 feet in length, 159 feet in breadth, and the spire (finished 1890), 530 feet high, is the highest in the world. The building was begun in 1377, and finished with the exception of the spire in 1494. The leading industries are flax, cotton, and woolen weaving; bleaching; the manufacture of paper, leather, and mixed fabrics; beer-brewing, ship-building, book-printing, etc. Ulm is famed for ornamental pipe bowls, its pastry, called Ulmer bread, and its trimmed lumber. Population, in 1895, 39,300; in 1900, 42,860. Ulm was a free Imperial city as early as the twelfth century, and had become very prosperous by the close of the Middle Ages. In 1530 the city accepted the Reformation, and the majority of the people have since been Lutherans. In 1802 Ulm was attached to Bavaria, and became part of Württemberg in 1810. Here on October 17, 1805, the Austrian general Mack surrendered to the French with about 23,000 men. Consult: Pressel, *Ulmisches Urkundenbuch* (Stuttgart, 1873); Loeffler, *Geschichte der Festung Ulm* (Ulm, 1883); Schultes, *Chronik von Ulm* (ib., 1886).

ULMIN. See Humus.

UL′PIAN (Domitius Ulpianus). A distinguished Roman jurist, a citizen of Tyre, who lived in the latter part of the second and the first part of the third century. Under Septimius Severus (A.D. 193-211) he became assessor in the auditorium of Papinian (q.v.), i.e. he was an associate justice when Papinian was prætorian prefect or Chief Justice of the Empire. Under Caracalla, who put Papinian to death, Ulpian retained his position; but Elagabalus stripped him of his dignities and exiled him from Rome. On the accession (A.D. 222) of the youthful Alexander Severus, to whose mother he was related, Ulpian was recalled, appointed guardian of the Emperor and prætorian prefect, and became the virtual Regent of the Empire. He was slain in B.C. 228 in a rising of the Prætorian Guard. Ulpian was one of the most prolific of the Roman legal writers. Besides voluminous commentaries on the civil law and on the prætorian edict, he published collections of cases ('opinions,' 'responses,' etc.), books of 'rules' and 'institutions,' treatises on the powers and duties of different magistrates, and many monographs. On account of the lucidity of his style, Justinian's compilers drew more largely upon his writings than upon those of any other jurist. Excerpts from his works constitute one-third of the *Digest*. Outside of Justinian's *Digest*, only one of Ulpian's books has been even partially preserved, viz. his monograph on rules (*Liber Singularis Regularum*), which appears to have been a hand-book for practitioners. It is frequently printed with the *Institutes* of Gaius, as in Muirhead's edition (Edinburgh, 1880), and in that of Abdy and Walker (3d ed., Cambridge, Eng., 1885). See Civil Law; Jurisconsult.

ULRICH, o͞ol′rĭk (1487-1550), Duke of Württemberg. He was the son of Count Henry IV., and at the age of eleven succeeded to the dukedom, assuming personal power in 1503. He added to the territory of Württemberg, but so impoverished the peasantry that in 1514 they rose in revolt. This he quelled only after many important concessions. By the murder of Hans von Hutten, brother of Ulrich von Hutten, he aroused the enmity of the dukes of Bavaria and the nobility. He was placed under the ban of the Empire, and was driven from the country by the Swabian League in 1519, and his possessions were sold by the League to Charles V., who transferred them afterwards to his brother Ferdinand. Ulrich went over to the Protestants, and with the aid of Philip of Hesse won back his dukedom, at the head of an army of 20,000 men (1534), but only as a fief of Austria. He then carried on the work of the Reformation, joined the Schmalkaldic League, and fought against Charles V. in 1546. He bought a precarious peace from the Emperor at great cost, and died in 1550 just as he was again threatened with deposition. Consult Kugler, *Ulrich, Herzog zu Württemberg* (Stuttgart, 1865).

ULRICH, ŭl′rĭk, Charles Frederick (1858 —). An American painter, born in New York City and educated at the Cooper Institute and the National Academy of that city. Afterwards he studied in Munich. In 1883 he was awarded the Thomas B. Clarke prize for his picture "In the Land of Promise," and was elected an associate of the National Academy. His pictures include "The Carpenter," "A Dutch Typesetter," "The Glass-Blowers," and "The Wood Engraver."

ULRICH VON HUTTEN, o͞ol′rĭK fôn hụt′-*ten*. See Hutten, Ulrich von.

ULRICH VON LICHTENSTEIN, lĭK′*ten*-stīn (c.1200-76). A German minnesinger, born in Styria, of an ancient noble race, and who was Landeshauptmann of Styria in 1245, headed the refractory Styrian nobility, and went through a terrible imprisonment in his own castle of Frauenburg. His chief work, *Frauendienst*, is invaluable for the history of civilization. In it he describes adventurous tournaments which he, a married man, undertook in the service of a high-born mistress. It is a sort of rhymed memoir work, covering the period from 1211 to 1255, interspersed with his own graceful lyrics.

ULRICH VON TÜRHEIM, tụr′hīm. A Swabian noble and epic poet of the thirteenth century. Of the details of his life nothing is known. He continued, using other sources, Gottfried von Strassburg's *Tristan und Isolde*, and Wolfram von Eschenbach's *Willehalm*. The former is conjecturally dated 1240, the latter, entitled *Der starke Rennewart*, 1250. Consult: Bechstein, *Tristan und Isolde* (Leipzig, 1875); and Lohmeyer, *Die Handschriften des Willehalm Ulrich von Türheim* (Halle, 1882).

ULRICI, o͞ol-rē′tsê, Hermann (1806-84). A German philosopher, born at Pförten, Brandenburg. He studied at Halle and Berlin, and after a brief career as a lawyer devoted himself exclusively to literature and philosophy. In 1834 he was appointed professor of philosophy at Halle, where he resided till his death. Among his works are to be mentioned: *Geschichte der hellenischen Dichtkunst* (1835); *Ueber Shakespeares dramatische Kunst* (1839; Eng. transl., 1864); *Ueber Princip und Methode der Hegelschen Philosophie* (1841); *Das Grundprincip der Philosophie* (1845-46); *System der Logik* (1852); *Gott und die Natur* (1862); *Gott und der Mensch* (1866-72). He was an opponent of the Hegelian philosophy, and endeavored to establish an empirical idealism.

UL′STER. The northernmost province of Ireland, comprising the nine counties of Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone (qq.v.). Total area, 8613 square miles. Population, in 1861, 2,389,263; in 1891, 1,619,814; in 1901, 1,581,350. The Presbyterians and Episcopalians constitute more than half of the inhabitants.

ULSTER KING-AT-ARMS. The chief heraldic officer of Ireland. See King-at-Arms.

ULTRAMARINE (from Lat. *ultra*, beyond + *marinus*, marine, from *mare*, sea). A blue pigment originally obtained from the mineral lazulite, or lapis lazuli (q.v.). The finest specimens of lazulite come from various localities in Persia, Siberia, and Chile, and when ground form the pigment; but, as only a very small proportion of that mineral is available, the pigment is very expensive. In 1828 Guimet, of Toulouse, was successful in producing it on a commercial scale, and almost simultaneously a synthetical method for its preparation was announced by Gmelin, of Tübingen. For the manufacture of artificial ultramarine, sodium sulphate, china clay, and carbon are ground together and heated in crucibles at a red heat for from six to nine hours. The resulting raw ultramarine, which is of a somewhat dull green color, is then crushed, mixed with powdered sulphur, and placed upon a roasting furnace, where it is heated with excess of air until the sulphur has been entirely burned off, when the mass assumes a bright blue color. A so-called direct method, which is said to yield better results, consists in using a mixture of sulphur 110 parts, china clay 100 parts, soda ash 90 parts, charcoal 20 parts, with some infusorial earth. These materials, after being carefully ground, well mixed, and pressed, are calcined in a muffle-furnace and yield, after heating from 12 to 18 hours, a blue ultramarine, which is then washed, ground, and dried. The pigment finds extensive use in the arts as a coloring material, owing to its brilliancy as a body color and high coloring power, especially in calico printing, in the manufacture of blue printing ink, for the printing of wall paper, in the making of blue writing paper, as a paint, and in the manufacture of blue mottled soap. It is also used as a whitening agent, correcting the yellow tinge in writing and printing papers, in cotton and linen goods, sugar, etc. *Cobalt ultramarine*, or 'Thénard's blue,' is a pigment prepared by mixing freshly precipitated alumina with cobalt arsenate or phosphate, drying the mixture, and then slowly heating it to redness. *Yellow ultramarine* is a pigment consisting of barium chromate.

ULTRAMONTANISTS (from Lat. *ultra*, beyond + *montanus*, mountainous, relating to a mountain, from *mons*, mountain; so called in allusion to the geographical position of Italy relative to the countries north of the Alps, and hence applied to the Italian party in the Roman Catholic Church). The name applied to those who recognize the Papal claim of supremacy over all national churches and sovereigns. Since 1870 it has been used also as a designation of all who accept the decrees of the Vatican Council, and in a broader sense it has been applied to the most conservative element in the Roman Catholic Church. In a purely political sense it has come to be used to designate the extreme Catholic party in almost every nation of Northern Europe. The Ultramontanists as a Church party first appeared in the Papacy of Gregory VII. (q.v.), who advanced the theory that the Pope had the power to depose and absolve temporal rulers. The enforcement of this theory would have had the effect of entirely superseding the freedom of action of the various churches, and its assertion aroused the opposition of powerful parties in the churches of Germany and France. After the Council of Constance (1414-18) (q.v.) the struggle between the Ultramontanists and the champions of the liberties of the various churches became the principal point of dispute within the ecclesiastical body. The opposition in the Gallican Church was particularly active, and has so continued to the present day. After the reconstruction of Europe, following the Napoleonic wars, the actual influence of the Ultramontanists was considerably decreased, although their principles were still tenaciously maintained and reasserted at every opportunity. In 1869-70, in connection with the meeting of the Vatican Council and the discussion of the doctrine of Papal infallibility, the political aspects of Ultramontanism assumed new importance. In Germany, Austria, and France the Catholic and Belgian parties in Parliament are designated by the name of Ultramontanes.

ULTRA VIRES, ŭl'trȧ vī'rēz (Lat., beyond one's powers). A legal term employed to indicate the acts of, or contracts entered into by, corporate bodies beyond the scope of the powers given to them expressly or by implication by their charters or the general law under which they were created.

ULTRA-VIRES CONTRACTS. *Ultra-vires* contracts of corporations should be distinguished from those which are illegal either by statute or some rule of the common law. Strictly an *ultra-vires* contract of a corporation is without legal validity to bind the corporation because the act is without or beyond the legal powers of the corporation, and therefore has no legal existence. Illegal contracts, on the other hand, are without such validity because of the positive prohibition of such contracts by the statute or common law on grounds of public policy. This distinction is important because of the difference in the consequences which flow respectively from *ultra-vires* contracts and illegal contracts of corporations. (For a fuller discussion of this subject, see QUASI CONTRACTS.) It is held by the English courts, by the Federal courts of the United States, and by the courts of some of the States that neither party to an *ultra-vires* contract can acquire any true contract rights under it. In each of these courts, except the English courts, it is also held that in case either party has given his performance under such a contract, he may recover the property or thing so given in an appropriate action, or the value of the performance so given, on theory of quasi contract. The distinction between rights on the contract and in quasi contract in case of *ultra-vires* contracts is often of the greatest importance.

The second view with reference to *ultra-vires* contracts, and the one which is held in most of the States, is that so long as such contracts remain executory neither party to the contract acquires any rights under it, it being a complete answer to an action brought by either party either for damages or specific performance that the contract is invalid because *ultra vires*. If, however, either party has performed the contract on his part, the other is held to be estopped to deny its validity, and the plaintiff may recover as though the contract were originally valid. The application of the doctrine of estoppel to such cases is anomalous and in many cases practically does away with the doctrine of *ultra vires*. In the case of negotiable paper issued *ultra vires* by a corporation, it is everywhere held that *ultra vires* is a personal and not a real defense (see NEGOTIABLE INSTRUMENTS), and cannot be set up against a *bona fide* purchaser for value, although it may be a valid defense against the original taker or holder of the paper. In determining what contracts are *ultra vires*, the courts have applied liberal rules of interpretation, holding not only that contracts expressly authorized were within the powers of the corporation, but that it has all the power to contract which can fairly be implied from the language of its charter and from the character of the business which it is authorized to conduct.

TORTS AND CRIME. Strictly all torts committed by the agents of a corporation while acting for the corporation are *ultra vires*, since a corporation has no express or implied authority to commit tortious acts. Following this course of reasoning, the early tendency of the courts was to hold that corporations could not be held legally responsible for torts. Governed, however, by considerations of policy, the courts hold that corporations are liable for all torts of their agents and employees committed by them within the scope of their authority. When malice is an essential element in the tort, the malice of the agent is imputed to the corporate principal. Upon similar principles corporations have generally been held responsible for minor criminal offenses, and in many States there are now special statutes governing the criminal responsibility of corporations. See LAW, CRIMINAL.

Courts of equity will take jurisdiction to restrain *ultra-vires* acts at the suit of a stockholder upon his showing that the directors or trustees of the corporation refuse to act. There is also statutory authority in some States for proceedings brought in behalf of the State by the Attorney-General to restrain *ultra-vires* acts when they are working a public injury, and at common law the State may proceed on the relation of a private individual to compel forfeiture of the charter of a corporation by *quo warranto* (q.v.) on the ground that the corporation is committing *ultra-vires* acts under such circumstances as to amount to a departure from the business or purposes for which it was organized. Consult the authorities. referred to under CORPORATION; CRIMINAL LAW; EQUITY; QUASI CONTRACT.

ULUA, o͞o-lo͞o'ȧ, **WOOLWA**, or SUMO. A group of tribes including the Sumo proper, the Cookra, the Poya, and others, constituting a distinct linguistic stock, occupying the headwaters of the streams which empty along the east coast of Nicaragua. They call themselves *Sumo*, the other names having probably been bestowed by their enemies, the Mosquito (q.v.). In physique they are below middle stature, of light brown complexion and handsome features, with chests and arms strongly developed. They live in huts consisting of palm-leaf roofs raised upon posts and sufficient to accommodate four families. The women wear only a short skirt of bark fibre, and both sexes are much given to painting. They also flatten the head. They plant fields of corn, cacao, sugar-cane, and chile, and the women are potters, while the men are especially expert boatmen and lumberers. Polygamy is common, and girls are frequently betrothed almost in infancy. Boys are subjected to various ordeals on arriving at manhood. Their principal ceremonial is a festival lasting several days and nights, during which they drink large quantities of *mishla*, a liquor prepared from the manioc root. Their dead are buried under sheds, and they have the curious custom of unwinding a long thread from the former owner's house to the grave, sometimes even for miles through the forest or across rivers.

ULUGH-BEG, o͝o'lụg-bĕg' (1394-1449). A Persian prince and astronomer, the grandson of Timur (q.v.). He succeeded, in 1447, to the Imperial throne of Samarkand on his father's death. He was a successful warrior, but happening to conceive suspicions of the loyalty of his eldest son, that prince rebelled, defeated and captured his father, and soon after caused him to be put to death.

Ulugh-Beg was the founder of the observatory at Samarkand, as a patron of astronomers and himself a diligent observer. His most important contribution to astronomical science is his star-catalogue, the first original one since that made by Ptolemy. The astronomical works of Ulugh-Beg were written in Arabic, afterwards translated into Persian, and thence the chronological portion of them into Latin by Greaves (London, 1650), and the geographical part (1652). An independent version in Latin and Persian was published by Hyde (Oxford, 1665). The latest edition of the star-catalogue was edited by Baily in 1843, and published in volume xiii. of the *Memoirs of the Royal Astronomical Society* (London, 1843).

UL'VERSTON. A seaport in Lancashire, England, 22 miles northwest of Lancaster (Map: England, C 2). Its parish church dates from 1111. It stands in an extensive agricultural and mining district, and has manufactures of cotton goods, iron, boilers, linen, paper, ropes, boots, and woolen yarn. Population, in 1901, 10,064.

ULYS'SES (Lat. *Ulysses*, *Ulixes*, *Olixes*, Athen., Bœot., Corinth. Gk. 'Ολυσσεύς, *Olysseus*, 'Ολυττεύς, *Olytteus*, general Gk. 'Οδυσσεύς, *Odysseus*, probably of Illyrian origin, influenced by popular connection with ὀδύσσεσθαι, *odyssesthai*, to be hated). A legendary Greek hero. According to the oldest legend, the Homeric, he was the son of Laertes, Prince of Ithaca, and of Anticleia, daughter of Autolycus. According to a later account, his father was the crafty Sisyphus; whence he is sometimes called, by way of reproach, Sisyphides. He married Penelope (q.v.), by whom he became the father of Telemachus. When the expedition against Troy was resolved on, Agamemnon and Menelaus prevailed on Ulysses, though with difficulty, to take part in it. Later traditions represent him as feigning madness—an artifice which failed through the skill of Palamedes. Once enlisted, Ulysses devoted himself to the success of the expedition; with Nestor's aid he secured the help of Achilles, and with Menelaus he undertook a fruitless embassy to Troy to demand the return of Helen and her treasures. When the Greek fleet assembled at Aulis, Ulysses brought twelve ships. In the narrative of the *Iliad* Ulysses plays an important part. In prudence and ingenuity of resource he is the foremost of the Hellenic chiefs, while in courage he is inferior to none. His later trait of trickery is seen in the episode of Dolon, but in the Homeric poems he is generally represented as a model of the older, as Achilles is of the younger, hero. After the fall of Troy, the Homeric narrative of his long wandering on his return to Ithaca is contained in the *Odyssey*. Setting sail for home, his ships were driven by a storm on the coast of Thrace, where he plundered the land of the Cicones, but lost a number of his crew. Having reembarked, a north wind blew them to the country of the Lotophagi (the 'Lotus-eaters'), on the coasts of Libya, where some of the companions of Ulysses ate of the wondrous fruit, and wished to rest forever. But their leader compelled them to leave the land, and, sailing north again, they touched at the 'island of goats,' where Ulysses left all his ships but one. Thence he proceeded to the 'land of the Cyclopes,' where occurred the adventure in the cave of Polyphemus (q.v.). With his reunited fleet he now visited the island of Æolus, ruler of the winds, who gave him a favoring breeze, and the unfavorable winds tied in a skin. This his companions, in search of treasure, opened, and at once they were swept back to the island, from which they were now sternly excluded. They then reached the land of the Læstrygonians, a race of cannibals, who destroyed all the ships but one. Escaping with his solitary ship, he next landed on the island of Ææa, inhabited by the sorceress Circe (q.v.). After a year's sojourn he was sent by Circe to the Kingdom of Hades, to inquire about his return from the blind seer Tiresias. Tiresias disclosed to Ulysses the fact of the implacable enmity of Poseidon, whose son, Polyphemus, he had blinded, but encouraged him at the same time with the assurance that he would yet reach Ithaca in safety, if he would not meddle with the herds of Helios (the sun-god) in Thrinacia.

He passed in safety the perilous island of the Sirens (q.v.), but in sailing between Scylla and Charybdis the monster that inhabited the first of these rocks devoured six of Ulysses's companions. He next came to Thrinacia, where his crew insisted on landing, and while storm-bound killed, in spite of their oath, some of the cattle of Helios while Ulysses was asleep. When they had sailed away, a fierce storm arose, and Zeus sent forth a flash of lightning that destroyed the ship. Every one on board was drowned except Ulysses himself, who, clinging to the mast, was finally washed ashore on the island of Ogygia, the abode of the nymph Calypso, with whom he lived for eight years. The nymph offered him immortality if he would remain, but his love for Penelope and longing for his home were too deep, and at the entreaty of his special guardian, Athena, Zeus sent Hermes to command his release. Sailing eastward in a skiff of his own building, he was seen by the implacable Poseidon, who roused against him a terrible storm, which wrecked his ship and from which he barely escaped with his life by the aid of Leucothea to the land of the Phæacians. Naked and worn by fatigue, he fell asleep, but was awakened by the sport of Nausicaa, daughter of the King, Alcinous, and her maidens. She received him kindly, and brought him to the city. Entering the palace under Athena's protection, he was entertained by the King, who promised him safe convoy to his home. On the magic Phæacian ship he fell asleep, and was landed, with the rich presents of the Phæacians, while still unconscious.

Disguised as a beggar, he repaired to the hut of the swineherd Eumæus, where he met and revealed himself to Telemachus. The next day he was brought by Eumæus to the palace, where he was recognized by his old dog, Argus. Here he was harshly treated by the suitors of his wife, who were living riotously on his estate. After an interview with Penelope, to whom he foretold her husband's return, he was recognized by his old nurse, Eurycleia, whom he bound to silence. When the suitors all failed to string the great bow, he took it, easily strung it, and shot the arrow through a row of twelve axes, thus accomplishing the test Penelope had proposed for the suitors. Then, aided by Telemachus, Eumæus, and the neatherd Philœtius, he slew all the insolent suitors. The last book of the *Odyssey* records his recognition by his father, Laertes, and a final reconciliation with the friends of the suitors, brought about by Athena's aid. The Homeric poems have a tradition of further wanderings to appease Poseidon, by introducing his worship among a people who knew not the sea, and finally a happy old age and painless death. Allusions show that to Ulysses was also given a prominent place in other episodes of the Trojan War, such as the battle over the body of Achilles, the invention of the device of the wooden horse, and the final sack of Troy. The other epics enlarged these episodes and added others, in which Ulysses frequently played but a mean-spirited part. This degradation of his character continued in many of the plays of the Attic tragedy, and was further developed in later writers, especially the comedians. His death in these narratives was usually attributed to his son by Circe, Telegonus, who had been sent by his mother in search of his father. Landing in Ithaca, he was met in arms by Ulysses, and slew him with a spear tipped with the sting of a ray, thus fulfilling the prophecy that death should come to him from the sea.

UMĀ, o͞o′mȧ. In Hindu mythology, one of the principal names of the consort of the god Siva (q.v.), also called Durga, Devi, Kali, Parvati, Bhavani, and, less frequently, Katyayani, Ambika, and Haimavati. The myths relating to this goddess, who is worshiped in various parts of India, but especially in Bengal, are recounted in the great epic poems and Puranas (q.v.), and in poetical works, but the text-book of her worshipers is the *Dēvīmahātmya*, or the majesty of Devi, and a portion of the *Mārkaṇḍōya Purāṇa*. In the *Rāmāyaṇa* (q.v.) she is the daughter of the nymph Mena and of Mount Himalaya, whence her names Parvati, Haimavati, Adrija, Girija, and similar ones, meaning 'the mountainous' or 'the mountain-born.' According to the Puranas, in a former life she was Sati, the daughter of Daksha (q.v.), but it was only as Uma that she bore to Siva Ganesa (q.v.), the god of wisdom, and Kartikeya (q.v.), the god of war. According to the *Harivanśa* (q.v.), in another life she was born as the daughter of Yasoda, and exchanged for Vishnu (q.v.), when, in his incarnation as Krishna, he was born as a son of Devaki. On that occasion she was killed by Kansa, and became a divine virgin, to whom the gods addressed their praises, whence she was called Kanya, or Kumari, the virgin. The principal myths concerning her were her destruction of the demons Madhu, Kaitabha, and Mahisha, or Mahishasura, her defeat of the army of Chanda and Munda, two demon servants of Sumbha and Niśumbha, and her destruction of the demons Raktavija, Sumbha, and Niśumbha. In commemoration of her victory over Mahishasura, a festival called the Durgapuja, or Durgotsava, is annually celebrated in Bengal. Three weeks later another festival, the Kalipuja, is held in honor of her destruction of Chanda and Munda. In her aspect of Uma, Parvati, and Devi, this deity is essentially benignant. As Kali or Durga, however, she is malignant. She dwells with Siva on Mount Kailasa, a peak of the Himalayas. Consult: Moor, *Hindu Pantheon* (London, 1810); Muir, *Original Sanskrit Texts*, vol. iv. (2d ed., ib., 1873); Wilkins, *Hindu Mythology* (ib., 1900). See *Pārvatī* in the Plate of HINDU DEITIES with INDIA.

UMAN, ōō-măn′. A Russian town in the Government of Kiev, on the Umanka, 170 miles south of Kiev (Map: Russia, D 5). It has two palaces belonging to the Counts Potocki. Population, in 1897, 28,628, of whom about three-fourths were Jews.

U′MATIL′LA. A tribe of Shahaptian stock (q.v.) formerly occupying the country about the junction of the Umatilla and the Columbia in northeastern Oregon, and now gathered with the Cayuse and Wallawalla upon a reservation in the same neighborhood. Like all the tribes of the same region, they subsisted originally on fish, game, roots, and berries, and did not practice agriculture. They were visited by Lewis and Clark in 1804, and about forty years afterwards by Jesuit missionaries, by whom some were converted and civilized. By a treaty of 1855 they agreed to come upon their present reservation. In 1903 they numbered only about 180.

UMBA′GOG LAKE. One of the Rangeley Lakes (q.v.).

UMBALLA, ụm-băl′lȧ. The capital of a district in the Punjab, India. See AMBALA.

UMBEL. A form of inflorescence (q.v.).

UMBELLIFERÆ (Neo-Lat. nom. pl., from Lat. *umbella*, umbrella, umbel, diminutive of *umbra*, shadow, shade + *ferre*, to bear). The PARSLEY FAMILY. A large and important natural order of dicotyledonous herbs and a few shrubs containing about 200 genera and 1500 species generally characterized by the inflorescence, an umbel which is often compound. The species abound chiefly in the temperate regions of the Northern Hemisphere. They generally have divided or compound, rarely simple, leaves, and usually abound in a resinous secretion, and volatile oils, on account of which many are reputed poisonous. Acridity is their general characteristic. Some are pleasantly aromatic, others have a powerful and disagreeable smell. In the roots of some, especially when enlarged by cultivation, starch and sugar are stored, so that they become useful for food. The systematic arrangement of the Umbelliferæ has been found difficult by botanists. Sprengel, De Candolle, Koch, and others have devoted much attention to this order. The North American species have been described by Coulter and Rose. Engler divides the genera into three suborders: Heterosciadieæ, Haplozygieæ, and Diplozygieæ, with nine tribes. The genera of economic importance include, Daucus, Pastinaca, Apium, Crithmum, Fœniculum, Carum, Ferula, Coriandrum, Pimpinella, Petroselinum, Archangelica, etc. Of succulent-rooted Umbelliferæ the carrot and parsnip are the best known examples. Skirret, earthnut (*Conopodium*), and arracacha are also of some value. The roots of *Annesorhiza capensis* and *Carum capense* are used as esculents at the Cape of Good Hope. The roots of *Chærophyllum tuberosum*, or sham, are used in the Himalayas. The herbage of *Prangos pabularia* is used in the temperate parts of the East Indies for feeding cattle, and made into hay for winter fodder. The blanched stems of celery, enlarged by cultivation, are a favorite salad, and those of alexanders (*Smyrnium olusatrum*) were formerly used in the same way. The candied stalks of eryngo were once much esteemed, and those of angelica are still used. The leaves of parsley, chervil, fennel, etc., and the seeds of anise, caraway, coriander, etc., are used for flavoring. Lovage (*Levisticum officinale*) is sometimes cultivated as a salad plant.

UMBER (from Fr. *ombre*, from Lat. *umbra*, shadow, shade). A mineral pigment resembling ochre, but differing from true ochre in containing some oxide of manganese. It is soft, earthy, and of a dark brown color. It occurs at many localities in Europe, notably in the island of Cyprus, and is also mined in Illinois, Pennsylvania, Georgia, and New York. Raw umber yields a brown paint, while burnt umber has a redder tinge. Both are stable and can be mixed with water or oil. See MINERAL PAINTS; OCHRE.

UMBILICAL CORD (from Lat. *umbilicus*, navel; connected with Gk. ὀμφαλος, *omphalos*, OIr. *imblin*, OHG. *nabalo*, Ger. *Nabel*, AS. *nafela*, Eng. *navel*), or NAVEL STRING. The bond of communication between the fœtus (which it enters at the umbilicus, or navel) and the placenta, which is attached to the inner surface of the maternal womb. It consists of the umbilical vein lying in the centre, and the two umbilical arteries winding from left to right round the vein. Contrary to the usual course, the vein conveys arterial blood to the fœtus, and the arteries return venous blood to the placenta. These vessels are imbedded in a yellow gelatinous matter, known from its first describer (in 1659) as the jelly of Wharton. Nerve filaments have been traced into the cord; but the presence of lymphatics is doubtful. The whole is invested by a membrane (the amnion), and its ordinary length is about 20 inches. As soon as a child is born, and its respiration fairly established, the umbilical cord is tied, and divided near the navel, which spontaneously closes, the fragment of cord dying away. See FŒTUS and PLACENTA.

UMBILICAL HERNIA. The term applied to the protrusion of intestine at the navel or umbilicus. It is of most frequent occurrence shortly after birth; but it is not uncommon in women who have been frequently pregnant. If the hernia is reducible, and the patient an infant, the ordinary course of treatment is, after returning the parts to their proper position, to place the convex surface of an ivory hemisphere on the navel, and to retain it there either with strips of adhesive plaster or with a bandage. Special trusses are made for the treatment of this affection in adults. In cases of irreducible hernia a large hollow pad should be worn. If it becomes strangulated, an operation may become necessary. Early operation is now often resorted to for the radical cure of umbilical hernia. See Hernia.

UMBILICUS. The anatomical term for the navel.

UMBRELLA-BIRD. A black South American bird (*Cephalopterus penduliger*), the size of a crow, whose head is ornamented with a crest forming a covering somewhat like a parasol, composed of straight elevated feathers with white and stiff shafts terminated by black beards which project forward. The sides of the neck are naked, but long, black, glossy, metallic feathers, forming a loose pelerine hanging below the breast, spring from the throat and sides of the neck. The tail is long and slightly rounded. There are two other closely allied species. They live in deep woods, make rough stick nests, and utter cries, especially at twilight, described as 'lowings.' See Cotinga and Plate of Cotingas, etc.

UMBRELLA PLANT. See Cyperus.

UMBRELLA TREE. See Magnolia; China Tree.

UMBRETTE. A peculiar heron-like bird (*Scopus umbretta*) representing alone an African family (Scopidæ) closely related to the shoe-bill (Balæniceps). It is a native of the wooded regions of Madagascar and most of Africa. It has a body about the size of a common fowl's, long naked legs, with very large, slightly webbed toes, and a large head with a long, strong, keeled stork-like beak, surmounted by a great crest, suggesting in profile the name 'hammerhead' given to the bird by many English observers. The plumage is purplish brown, with black tail bars; and its smoky tints make it almost invisible in the dusk when it most often goes abroad. At night, according to Evans, it roosts in trees. Its food consists of fish, reptiles, frogs, worms, mollusks, and insects captured in shallow water; and while feeding the birds have a curious habit of skipping round each other with extended wings. The note is a harsh quack or weak metallic sound. The nest is an enormous structure of sticks, lined with roots, grass, rushes, or clay, having a hole at the side, and ordinarily a flat top; it is placed in a tree, on a rocky ledge, or exceptionally on the ground. Three to five white eggs form the complement.

UM′BRIA. In ancient geography, a country of Central Italy, corresponding loosely with the modern territorial division of the same name, which constitutes the Province of Perugia. At an early date the name Umbria was applied indefinitely to a large territory in Central and Northern Italy. The Umbrians were among the oldest and most powerful nations of Italy, and probably held all the land in Central Italy between the Adriatic and the Tyrrhenian Sea. This territory was gradually decreased by the encroachment of the Etruscans on the west, of the various Celtic tribes on the north, and of the Picentes on the south, until the Umbrians were shut off from the sea in the valleys east of the Apennines.

Umbria at the period of the Roman conquest of Italy was bounded on the north by the *Ager Gallicus*, on the east by Picenum, on the south by the country of the Sabines, and on the west by Etruria. The historical prominence of the Umbrians ends with the beginning of the third century B.C.; they were defeated by Rome in B.C. 308, and, with the other confederated peoples, were crushed at the battle of Sentinum, B.C. 295. After B.C. 220 the Via Flaminia ran through the country. Umbria, together with the *Ager Gallicus*, which had been restored to the territory after the conquest of the Senones by the Romans, constituted the sixth region of Italy in Augustus's division. Knowledge of the Umbrian civilization and language has been gained chiefly from inscriptions, as the accounts left by ancient writers are of uncertain value. The most important of these epigraphical remains are the seven bronze tablets found at Gubbio (the ancient *Iguvium*, the mediæval *Eugubium*) in 1444. See Eugubine Tables; also, for the language, Italic Languages, paragraph *Umbrian*.

The district known in modern times as Umbria was a part of the Papal States until 1860. The Province of Perugia has an area of 3748 square miles. The population in 1901 was 675,352. The surface is mountainous, but the valleys are fertile. Capital, Perugia (q.v.).

UMBRIAN SCHOOL OF PAINTING. The name applied to the Central Italian painters of the Renaissance, living chiefly within the modern Province of Umbria. The Umbrian school is characterized by its intense but dreamy religious sentiment. This is achieved by the ecstatic expression of the faces and by the effect of great distance or spaciousness. The Umbrians had admirable illustrative qualities and good color, but they were deficient in form and dramatic action. Though usually classed as Umbrians, the principal painters of the northern part of this territory differed from the others in their high proficiency in form and motion. Such artists were Piero degli Franceschi (d.1492), and his pupils, Melozzo da Forli and Luca Signorelli. Gentile da Fabriano (d.1428) may be considered the first great Umbrian painter. Fra Angelico and his pupil Benozzo Gozzoli exercised a strong influence. The founder of the Umbrian school in its narrower sense was Niccòlò da Foligno, and the first important Perugian master was Bonfigli; then in the later fifteenth century came Fiorenzo di Lorenzo, Pinturicchio, and Perugino, its best known master next to his pupil Raphael. All the best qualities of the school culminated in Raphael, who added the best that Florence and the antique could give. A characteristically Umbrian contemporary of Raphael was "Lo Spagna" at Spoleto. Consult Berenson, *Central Italian Painters of the Renaissance* (New York, 1897), and the works cited under Florentine School of Painting.

UMBRINE. A fish. See Meagre.

UMLAUFT, ōōm′louft, Friedrich (1844—). An Austrian geographer and author, born and educated in Vienna, where he became professor at the State Gymnasium of Mariahilf and at the municipal Teachers' College in 1870. He wrote: *Die österreichisch-ungarische Monarchie* (3d ed. 1896); *Die Alpen, Handbuch der gesammten Alpenkunde* (1887; English trans., 1889). After 1882 he was editor of the *Deutsche Rundschau für Geographie und Statistik*.

UMLAUT, o͞om′lout (Ger., sound-change). In comparative philology, the change undergone by a vowel or diphthong through the influence of a following vowel. It is, therefore, essentially a process of regressive vowel-assimilation. It occurs frequently throughout the Indo-Germanic linguistic group, although it is a characteristic only of the Germanic languages. As examples of umlaut, occasionally called mutation by English writers, may be cited Avesta *vohu*, 'good,' *mošu*, 'soon,' but Sanskrit *vasu, makṣu;* Armenian *keam*, 'I live,' but Sanskrit *jīvāmi;* Bœotian Greek *τρεπέδδας*, 'table,' but Attic *τράπεζα*; Attick Greek *ἥμυσυς*, 'half,' beside *ἥμισυς*; Latin *nihil*, 'nothing,' from *ne hilum*, 'not a thing;' Vulgar Latin *vixillum*, 'banner,' *butumen*, 'pitch,' but Latin *vexillum, bitumen;* Old Irish *cloth*, 'famous,' but Greek *κλυτός*; Old Church Slavic *bĭdr ĭn ŭ*, 'watchful,' beside *bŭdrĭnŭ, bŭdrŭ;* Lithuanian *budrù*. In Germanic umlaut is caused either by *i* or *u*. The *i*-umlaut changes a preceding *e* to *i*, and *a* to *e*, as Gothic, Old High German *ist*, 'is,' but Greek *ἐστί*; Old High German *gesti*, plural of *gast*, 'host.' In Middle High German the *i*-umlaut changes *o, u, ā, ō, ū*, and *uo* to *ö, ü, ae, oe, iu*, and *üe* respectively, as *löcher*, plural of *loch*, 'hole,' *süne*, plural of *sun*, 'son,' *gaeben*, subjunctive of *gāben*, 'gave,' *hoeren*, present of *hōrte*, 'heard,' *briute*, plural of *brūt*, 'bride,' *güete*, 'goodness,' from *guot*, 'good.' The chief *i*-umlauts in Anglo-Saxon are of *æ, ā, o, ō, u*, and *ū* to *e, æ, e*, or usually *y, ē*, and *y* respectively, as Anglo-Saxon *weccan*, 'to wake,' Gothic *wakjan; hælan*, 'to heal,' from *hāl*, 'health,' *exen*, plural of *oxa*, 'ox,' and *gylden*, 'golden,' from *gold*, 'gold,' *dēman*, 'to judge,' from *dōm*, 'judgment;' *wyllen*, 'woolen,' from *wulle*, 'wool;' *cyþan*, 'to proclaim,' from *cyþ*, 'famous.' In Icelandic also the *i*-umlaut plays an important part.

The *u*-umlaut is less far-reaching than the palatalization caused by *i*. It does not occur in Gothic (owing probably, in part, to the deficiencies of the Gothic system of writing) or in Old, Middle, or New High German. It is found, however, in Anglo-Saxon, and, highly developed, in Icelandic. In Anglo-Saxon *a* before *u* or *o* becomes *ea*, *e* becomes *eo*, and *i* becomes *io*, although these umlauts are by no means regular in their action. Examples are *ealu*, 'ale,' but genitive *alo* , *ealo* , Northumbrian *al es; weorod*, 'folk,' beside *wer od; mioluc*, 'milk,' but Gothic *miluks*. The principal Icelandic *u*-umlauts are of *a* to *o, ā* to *ō, e* to *ö, ē* to *ö, i* to *y, ī* to *y, ei* to *öy* or *ey, ia* to *io, ua* to *uo* or *o, uā* to *ō, ui* to *y, uī* to *y*, and *ue* to *ö*. There are other minor umlauts. Anglo-Saxon has a palatal umlaut which changes the *eo* and *io* arising from the 'breaking' of Germanic *e* and *i* before a guttural *h* plus a consonant to *ie* and later to *i, y*, and before palatals *ea* and *ēa* later became *e, ē*. Examples are *rieht, ryht*, 'right,' beside *reoht*, Old High German *reht; Wiht*, 'Wight,' beside *Wioht; sex*, 'knife,' beside earlier *seax; ēge*, 'eye,' beside earlier *ēage*. In Icelandic there are traces of an ʀ-umlaut, as in *ær*, 'they' (feminine), but Old Swedish *aʀ*, Gothic *os*. In German umlaut survives as an important element in the inflection. It is found especially in nouns, as *Brüder*, plural of *Bruder*, 'brother' (but Old High German *bruoder* for both numbers), *Söhne*, plural of *Sohn*, 'son' (Old High German *suni, sun*), *Hände*, plural of *Hand*, 'hand' (Old High German *henti, hant*), *Lämmer*, plural of *Lamm*, 'lamb' (Old High German *lembir, lamb*). It also characterizes the comparative and superlative degrees of adjectives, as *jung*, 'young,' *jünger, jüngst* (Old High German *jung, jungiro, jungisto*), and is seen in the imperfect subjunctive of certain verbs, as *hätte* from *haben*, 'to have' (Old High German *habēti*). In English there are only sporadic traces, as in *men, mice, feet*, as plurals of *man, mouse, foot* (Anglo-Saxon *men, mæn, mys, fēt*, plurals of *man, mūs, fōt*), and in causative verbs, as *set* from *sit* (Anglo-Saxon *settan* from *sittan*, Gothic *satjan* from *sitan*, pret. *sat*).

UMRIT′SAR. A city of the Punjab, India. See AMRITSAR.

UNA. The principal female personage in the first book of Spenser's *Faerie Queene*. She stands in the allegory for the quality of Truth, and is beautiful, pure, and trustful. She is the companion of the Red Cross Knight (q.v.) on his mission from the Court of Gloriana, but is soon separated from him by Archimago and undergoes many painful adventures until rescued by Prince Arthur and restored by him to her knight.

U′NAKA MOUNTAINS (called also, in whole or in part, the SMOKY or GREAT SMOKY MOUNTAINS). A southwestern division of the Appalachian Mountains. They branch off from the Blue Ridge in southern Virginia, and extend southwestward on or along the boundary between Tennessee and North Carolina, penetrating a short distance into northern Georgia (Map: North Carolina, A 4). On the west they are separated from the Cumberland Plateau by the great eastern valley of the Tennessee, and on the east they are connected with the Blue Ridge by an intricate system of cross ranges forming the rugged and much dissected remnants of a lofty plateau culminating in the Black Mountains. Nearly all the eastern headstreams of the Tennessee rise on this inclosed plateau and break through the Unaka Range. Otherwise the latter forms a sharply defined ridge, whose crest is the boundary line between Tennessee and North Carolina. In the north, however, there are three main ridges inclosing fine valleys. The average elevation of the main ridge is from 3000 to 5000 feet, the middle portion, which is generally known as the Great Smoky Mountains, being the highest. Here a number of peaks exceed an altitude of 6000 feet, extending their bare rocky summits above the timber-line. The highest is Clingman Dome with an altitude of 6619 feet. The range is composed chiefly of Lower Silurian sandstones and shales, with some Archæan metamorphic rocks. The slopes are covered with pine forests, and the range abounds in grand and rugged scenery.

UNALASKA, o͞o′nä-läs′kȧ, or **UNALASHKȦ**. The second largest and most important of the Aleutian Islands. It is situated in latitude 53° 30′ N., longitude 167° W., 135 miles southwest of the extremity of the Alaska Peninsula (Map: Alaska, B 5). It is about 75 miles long and from 10 to 25 miles wide; its coasts are indented with fiords, and it consists mainly of barren and treeless mountains, among which rises the volcano of Makushin to a height of 5961 feet. The island is thinly populated by Aleuts and a few Russians and Americans, chiefly engaged in fishing and sealing. The largest inhabited place is Unalaska Village or Iliuliuk, with a population, in 1900, of 428. It is the chief port of call for all vessels navigating Bering Sea, and since the gold discoveries its trade has increased considerably.

UNAU. The two-toed sloth (q.v.).

UN'CAS (?-c.1683). A famous sachem of the Mohegan Indians in Connecticut. At first a Pequot chief, he revolted about 1635 and collected a number of Indians, who took the name of Mohegans, which had once belonged to the Pequots, against whom he fought as an ally of the English in the Pequot War of 1637. (See PEQUOTS.) He was rewarded by the whites with a grant of Pequot lands. In 1643 he defeated the Narraganset chief Miantonomoh (q.v.), and somewhat later, with the sanction of the commissioners representing the United Colonies of New England, had him put to death. In 1648 the Mohawks and Pocomtocks began an unsuccessful war against him. In 1657 he was besieged by the Narraganset sachem Pessacus, but, according to tradition, was relieved by Ensign Thomas Leffingwell, to whom he is said to have granted the site of Norwich, Conn. The date of his death is unknown, though he is known to have been alive in 1682. A monument to his memory was erected at Norwich, Conn., in 1842. Consult: Stone, *Uncas and Miantonomoh, a Historical Discourse* (New York, 1842); Drake, *The Book of the Indians of North America* (Boston, 1834).

UNCIAL LETTERS. A term applied in Greek and Latin paleography to a modification of capital letters, which are made rounded instead of square, as being written on papyrus or vellum. See section *Letters and Their Forms*, under PALEOGRAPHY.

UNCLEANNESS. As used in the Old Testament, a term having several shades of meaning. In its primary sense it signifies a bodily condition which during its continuance excluded from the 'holy community.' Such a condition might be produced by a variety of causes, as childbirth (Lev. xii.), contact with a dead body (Num. xix. 11-12), or leprosy (Lev. xiii.-xiv.). Various purificatory rites are prescribed in the Pentateuchal codes to free from this condition. In a wider sense the term 'unclean' is applied to animals prohibited as food (Lev. xi.; Deut. xiv. 3-21), and the fruit of trees was unclean (i.e. could not be eaten) for the first three years (Lev. xix. 23). Certain functions of the body were very generally regarded in early times as rendering a person unfit to perform the rites of religion, or, in other words, to approach the deity. These functions are all connected in some way with the phenomena of reproduction.

The stipulations in regard to certain animals regarded as unclean belong in a different category. In all parts of the world certain animals are regarded as sacred either because a clan regards itself as descended from a particular animal or because for other reasons the animal in question is regarded as affording protection to the clan. Accordingly the animal formerly regarded as sacred comes to be avoided as unclean. And connection with the widespread symbolism of giving to deities the shapes of animals leads to the conception that certain animals are to be avoided because of their demoniac nature. In the Pentateuchal regulations all these factors may be traced—the sanctity attached to certain animals, their position as totems, as well as the later conception which regarded them as the abode of evil spirits.

In primitive religions disease is ascribed to the presence of a demon or evil spirit in the body, brought there by the power of a sorcerer or witch. A cure is thought to be effected by certain rites in which sympathetic magic plays a prominent part. In the Pentateuchal codes, however, an advance in religious ideas is manifested by designating a diseased person as one 'smitten' by God. The disease chiefly dealt with is a form of leprosy, which is still common in the East. From disease to death is but a short step, and the primitive views held in regard to death lead to precautions to be exercised by those who are obliged to come into contact with a dead body. On the one hand, death itself indicates the triumph of the evil spirit, while on the other, the uncertainty as to the whereabouts of the soul or spirit of the dead person incites fear and likewise leads to precautions against the unexpected return of the spirit which has perhaps only temporarily disappeared. By a natural extension of the term the dead person is regarded as unclean.

The rabbinical schools in Babylonia and Palestine elaborated the subject still further, and in the Talmud the laws and degrees of the various kinds of uncleanness are set forth in great detail accompanied with minute discussions of casuistical problems raised in connection with the subject. The extension of the term unclean to the fruits of trees for the first three years is quite secondary, and dates from the late period when it had acquired the general sense of forbidden, without reference to any genuine uncleanness connected with the transgression involved. The prohibition appears to have been a purely economic regulation to insure productiveness. Consult the commentaries on the passages cited and the Hebrew archæologies of Nowack and Benzinger; also Stade, *Geschichte des Volkes Israel*, vol. i. (Berlin, 1887).

UNCLE SAM. See NATIONAL NICKNAMES.

UNCLE TOM'S CABIN. See STOWE, HARRIET BEECHER.

UNCOMMERCIAL TRAVELLER, THE. A series of papers written by Charles Dickens for *All the Year Round*, from January 28 to October 13, 1860, in book form in 1860. In the edition of 1868 eleven new sketches were added to the first collection, and that of 1869 was increased by seven more. The papers consist of stories and impressions, humorous and pathetic, gained, doubtless, during the author's early journalistic experiences in London.

UNCONFORMITY. A term applied in geology to a break or interruption in the sequence of rock formations. In areas of stratified rocks one series may be found sometimes to rest upon the upturned or eroded edges of another series, thus showing that the deposition of the inferior beds was followed by an upheaval, during which they were disturbed from their horizontal position or were eroded, and then by a depression beneath the water, where the upper series was deposited. An unconformity, therefore, marks a hiatus in the geological record—a lapse of time unrecorded by sedimentation—and it is only by examining the sequence of deposits in other regions that the missing series can be supplied. Similarly, unconformities may exist in regions of igneous or metamorphic rocks. They are valuable to the geologist in fixing the limits of natural rock groups.

UNCTION (Lat. *unctio*, an anointing, from *unguere*, to anoint; connected with Skt. *añj*, to anoint, smear). The practice of anointing the body, or certain portions of the body, with oil, especially with the oil of olives. It was resorted to by the ancients from motives of health, of athletic development, or of luxury; but the practice now is chiefly a religious one. It was a rite in frequent use among the Egyptians, as well as the Greeks and Romans. Among the Hebrews priests and kings were anointed upon being set apart for their several offices, as were also sacred vessels. The oil employed in these religious unctions was prepared of the most precious perfumes and balsams. In Christian use, anointing from a very early time possessed the same sacred significance. (See EXTREME UNCTION.) Besides the anointing of the sick, however, there are many other sacred unctions traceable in ancient Christian practice; namely, in baptism, confirmation, ordination, consecration of churches, and the coronation of kings.

UNDERGROUND RAILROAD. The name popularly applied before the Civil War to the system adopted by many persons in the North for aiding fugitive slaves to escape from their masters and elude the pursuit of those sent to reclaim them. By furnishing food and shelter as well as advice to fugitives, they enabled thousands to escape to Canada beyond the reach of the Fugitive Slave Law. The most favored routes lay through Ohio and Pennsylvania. The houses along these routes where aid was given came to be known as 'stations;' those who directly assisted the escaping fugitives were known as 'conductors;' and those who made contributions of money, clothing, etc., were known as 'stockholders' in the enterprise. It was estimated that the number of negroes in Canada who made trips to the South to assist their friends in escaping from slavery amounted to 500 annually before the outbreak of the war. Large rewards were offered by Southern legislatures and individuals for the delivery of such persons south of Mason and Dixon's line. Among the most active white persons in the 'underground railway' service were Levi Coffin, Josiah Grinnell, Gerrit Smith, Theodore Parker, Thomas Garrett, Rev. Charles Torrey, and Samuel J. May. Coffin was commonly styled the president of the concern, and he claimed to have been actively engaged in the business for thirty-three years and to have received into his house an average of 100 fugitives annually. Professor Siebert in his exhaustive work on the subject gives the names of 3211 'agents, station keepers, and conductors.' He credits Daniel Gibbons, of Lancaster, Pa., with having aided 1000 fugitives to reach Canada; Dr. N. M. Thomas, of Michigan, with having aided 1000 or 1500; Rev. Charles Farrer with having aided 400; Philo Carpenter, of Chicago, with having aided 200; while H. B. Leper, of Princeton, Ill., aided 31 runaways to reach Canada in six weeks. Thomas Garrett (q.v.) claims to have aided 2700 to make their escape. Harriet Tubman, a negress, who escaped from Maryland, is reported to have made nineteen journeys to the South and to have brought away altogether 300 slaves. She subsequently served with success during the Civil War as a scout. Many of those concerned in this service were fined heavily for violating the Fugitive Slave Law, Garrett alone paying a fine of $8000, but the occasional punishments that were inflicted did not break up the practice, and it continued to be one of the chief grievances of the South against the North. Consult Siebert, *The Underground Railroad* (New York, 1899).

UNDERGROUND RAILWAY. See RAILWAYS; TUNNEL; SUBWAY.

UN'DERHILL, JOHN (?-1672). An American colonist, born probably in Warwickshire, England. In his youth he saw military service in the Low Countries and Spain, and in 1630 he accompanied the elder John Winthrop to Boston as commander of the militia. Four years after his arrival he was elected to the Colonial Assembly, and in 1637 he aided Capt. John Mason (q.v.) to exterminate the Pequot Indians. Of this expedition he wrote an account entitled *Newes from America*, which was published in London the following year. In spite of the services he had thus rendered, he incurred the wrath of the colonists by espousing the Antinomianism of Wheelwright and by his immorality. Forced to flee from Massachusetts, he took refuge at Dover in New Hampshire, and was there elected Governor. Later he removed to Connecticut and became a member of the Assembly. In 1643 he entered the military service of the New Netherlands, but ten years later he was expelled from that colony and went to Rhode Island, where he obtained a commission to make war on his late employers. In 1664 the New Netherlands were conquered by the English, and Underhill returned and settled at Oyster Bay, where, three years later, he obtained a grant of 150 acres of land from the Mantinenoc Indians. On this property, which he named Killingworth, he passed his later years.

UNDER-LEASE. The creation of a new term by a lessee of lands, by alienation of a portion of or an interest in his own term, with a reversion in himself. Where a lease is silent on the question, a lessee may make a valid under-lease, so long as the conditions in the original lease are observed. See LEASE.

UNDERSTANDING. A term which has been employed in various philosophical systems, from Plato to Hegel, as in some sort antithetical to reason. In general, the point of distinction has been that reason is the higher, understanding the lower faculty of cognition; that reason apprehends intuitively and in wholes, understanding discursively, on the ground of premises and hypotheses which it does not itself test; that reason moves above the realm of sense, while understanding is indebted for its material to the empirical data of sensation. In the modern psychological system 'reason' and 'understanding' have either dropped out of use or at least have come to play a very subordinate part. Consult: Wundt, *Physiologische Psychologie* (4th ed., Leipzig, 1893); James, *Principles of Psychology* (New York, 1890); Sully, *The Human Mind* (London, 1892).

UNDERWING MOTH. Any noctuid moth of the subfamily Catocalinæ, and especially one of the type genus Catocala, of which more than a hundred species inhabit the United States. Many have beautifully colored hind wings, which, however, are entirely concealed by the others when they are at rest. They are night-fliers, and generally pass the day upon trunks or branches of trees which they closely resemble in coloring. The larvæ are inconspicuous, and are usually protectively colored, and curious lateral structures have been developed for the purpose of disguising the resting-line between the larva and the surface upon which it stands. Some of them have developed bright warning colors in spots which may be exhibited at the will of the larva.

UN'DERWOOD, Lucien Marcus (1853—). An American botanist, born in New Woodstock, N. Y., and educated at Syracuse University. He taught in Illinois Wesleyan University (1880-83), in Syracuse University (1883-91), in De Pauw University (1891-95), and in the Alabama Polytechnic Institute (1895-96), whence he was called to a chair of botany in Columbia University. He published *Our Native Ferns and How to Study Them* (1881; revised in 1882 as *Our Native Ferns and Their Allies*, 5th ed. 1900); *Descriptive Catalogue of North American Hepaticæ* (1884); *An Illustrative Century of Fungi* (1889); *Hepaticæ Americanæ* (1887-93); *Moulds, Mildews, and Mushrooms* (1899); and several bulletins of the Alabama Agricultural Experimental Station.

UNDERWRITER. In ordinary usage, a person who is authorized to negotiate insurance contracts. In modern financial practice a peculiar form of insurance has arisen to which the term underwriting is applied. It has been resorted to for many years in marketing new securities for established corporations, but has reached its highest development in the financing of the large industrial corporations recently formed. When a large corporation is organized to absorb a number of existing companies it is usually necessary to raise a large sum of money to serve as a working capital or to be employed in the purchase of stock in the original companies which holders are unwilling to exchange for new securities. To raise this cash the services of an underwriter are usually secured. The underwriting contract is one by which the company is assured of a definite amount of capital within a stated time. The underwriter binds himself to take at some stated future time a stipulated part of the securities of the new company at a price named in the contract, unless such a part is sold before that time at as high a price. He usually further agrees to advance at once the capital needed to launch the company. The underwriter leaves a wide margin between the price at which he agrees to take the stock and the price at which he hopes to sell it. A part of his reward comes from this source. He sometimes exacts in addition a bonus of stock for himself, or a commission on all stock sold, and occasionally stipulates that none of the stock given to others shall be put on the market until he has disposed of the entire amount that he has underwritten.

The securities of a corporation of any magnitude are seldom underwritten by a single person or firm. The original underwriter usually allows other bankers or favored customers to share in the underwriting. The group is known as an underwriting syndicate. The original underwriter usually acts as syndicate manager. Each member of the syndicate subscribes for a part of the stock. The cash that has to be raised to carry out the agreement with the company is secured by the syndicate manager partly through an assessment pro rata upon the members of the syndicate, partly by borrowing on the security of the underwriting. At the expiration of the time limit the syndicate manager distributes the profit of the transaction pro rata among the members, if the specified amount of stock has been sold. If some of it still remains unsold, whatever profit has been realized is distributed, and each member of the syndicate is called upon to take his proportionate share of the unsold stock at the stipulated price.

UNDINES (ML. *undina*, from Lat. *unda*, wave). The name given in the fanciful system of the Paracelsists to the elementary spirits of the water. Paracelsus describes the Undines in his *Treatise on Elemental Spirits*. They are of the female sex. Of all the different orders of elementary spirits, they intermarry most readily with human beings, and the Undine who gives birth to a child under such a union receives with her babe a human soul. But the man who takes an Undine to wife must be careful not to go on the water with her, or at least not to anger her while there, for in that case she will return to her original element. Should this happen, the Undine is not disposed to consider her marriage dissolved; she will rather seek to destroy her husband, should he venture on a second marriage. Fouqué has made this Paracelsist fancy the basis of an exquisite tale, entitled *Undine*, published in 1814, and frequently translated into English.

UNDUE INFLUENCE. In law, such an influence or control exercised over the mind of a testator that his will is practically overpowered, and that he is constrained by it to make some disposition of his property by will contrary to his own best judgment and wishes. Mere persuasion, appeals to the charity, benevolence, affections, gratitude, or pride, of a testator will not constitute undue influence, unless carried to such an extent that the mind of the testator is virtually overpowered. For example, one of several children may suggest to one of their parents that the latter should bequeath to him a larger share of his property than to the others, and urge as a reason that he labors under some disability rendering him less able to support himself than the others, or that the others have been abundantly provided for by bequests or devises from other relatives, etc. Where a will is contested on the ground of undue influence, the courts will scrutinize very carefully the relationship which existed between the testator and the beneficiary, and if it was of a confidential or fiduciary character, as that of attorney and client, physician and patient, religious confessor and confessant, such a fact is regarded as a suspicious circumstance, which, taken in conjunction with proof of active efforts on the part of the beneficiary to induce the testator to make his will in favor of the former, may give rise to a presumption of undue influence. Ordinarily, however, where undue influence is charged, the burden of proof rests upon the party making it. Any person, who would have been a legal heir if the testator had died intestate, may contest his will on the ground of undue influence, and if he is successful the court will refuse to probate the will. See WILL, and its bibliography.

UNDULATORY THEORY OF LIGHT. See LIGHT.

UNEARNED INCREMENT. The extent to which the value of real property increases independently of any expenditure of labor or capital upon it by its possessor. See the article SINGLE TAX.

UNEMPLOYMENT. A term applied in recent years to that condition of industrial life in which there is a considerable number of workmen out of work. In its widest application it describes the condition of several classes. In a report by the Labor Department of the English Board of Trade, in 1893, the term is used of four distinct classes: (1) Those who, engagements being for short periods, have terminated their last engagement on the conclusion of a job, and have not yet entered on another; (2) those who belong to trades in which the volume of work fluctuates, and who, though they may obtain a full share during each year of the work afforded by their industry, are not at the given time able to get work at their trade; (3) those who are economically suffering because there is not enough work in those trades to furnish a fair amount to all who try to earn a livelihood at them; (4) those who cannot get work because they are below the standard of efficiency usual in their trades, or because their personal defects are such that no one will employ them. Another classification divides the unemployed more briefly into three classes: (1) Members of season trades; (2) members of decaying trades; (3) the 'fringe' or least competent members of every trade. These are broad definitions, including two separate groups, those who for one reason or another, as feebleness, illness, old age, criminal characteristics, or mental deficiency, are incapable, and, secondly, those who are able and willing to work but cannot find it. The first class has always existed, and its presence occasions different phases of the problems of poverty and pauperism. The existence of the second class constitutes more strictly the problem of unemployment. Irregularity of employment even for competent workmen is not a modern phenomenon. It has been characteristic of every stage of economic development; but, on account of the growth of industrial democracy and the development of humanitarian interest, the evil assumes new importance. On this point Professor Marshall writes: "When a large factory goes on half time, rumor bruits the news over the whole neighborhood, and perhaps the newspapers spread it all over the country. But few people know when an independent workman, or even a small employer, gets only a few days' work in a month; and in consequence whatever suspensions of industry there are in modern times are apt to seem more important than they are relatively to those of earlier times. In earlier times some laborers were hired by the year, but they were not free, and were kept to their work by personal chastisement. There is no good cause for thinking that mediæval artisans had constant employment. And the most persistently inconstant employment now to be found in Europe is in those non-agricultural industries of the West which are most nearly mediæval in their methods and in those industries of Eastern and Southern Europe in which mediæval traditions are strongest. Though the rapidity of invention, the fickleness of fashion, and, above all, the instability of credit, do certainly introduce disturbing elements into modern industry, yet other influences are working strongly in the opposite direction." (Vol. i., p. 775). Professor Cunningham, in his exhaustive study of the *History of Commerce and Industry* in England, presents abundant evidence on this point, and concludes that the artisan of one hundred years ago was less regular in his work and less steady in character than the skilled artisan of to-day. (Vol. ii., p. 474.)

The immediate causes of unemployment are many. Chief among them are: (1) Fluctuations due to change of season, as in the building trades, in dock labor in London, or in the tea, wool, and timber industries; (2) introduction of new machinery and transformation of processes; (3) migration of labor from rural districts to the city, or from one country to another; (4) displacement of adult males by women or children; (5) shifting of the seat of an industry from one place to another; (6) change in fashion; (7) industrial depression or the operation of some extraordinary occurrence, as war. Some of these causes have been in operation with increasing force since the revolutionary inventions of the eighteenth century, and the introduction of new methods of transportation in the first half of the nineteenth century. The influence of the causes mentioned has been accentuated during the past century by the periodic appearance of crises which profoundly affect the entire organization of trade and industry. Under the strain of international competition markets become more and more sensitive to remote disturbing influences; production may unexpectedly cease and entire classes of workmen for weeks together be thrown out of work. In addition to these causes, which are clearly recognizable, various theories, involving a discussion of the fundamental principles of political economy, have been advanced to explain the phenomena of unemployment. Only a reference can be made to these. First, the theory of overproduction: under the present system of production, with its enormous capacity for manufacture, more goods are created than are required to satisfy the market needs; consequently there must be cessation at regular intervals until the excess supply has been taken up. Second, the theory of under-consumption: the rich hoard and invest too much in fixed capital, while the poor have not the power of wholesome consumption. Third, the theory of inflated credit: the extensive organization of business, the promotion of new enterprises, the growth of banking institutions for the sale of credit have all stimulated the growth of the credit system; the settlement of contracts is thus made contingent upon future success; this development goes beyond the limits of safety, and periodically necessitates contraction; this in turn depresses industry, and men are thrown out of work. Fourth, the Socialist theory, which attributes unemployment to the institution of private property and the practice of individual competition: these necessarily cause a never-ending fluctuation of supply and demand, and prevent a harmony of industrial interests.

Statisticians have not as yet devised any satisfactory method of determining the amount of unemployment. To be complete such figures should show the number of unemployed on a given day; and, secondly, the duration of unemployment for each workman during the year. As a rule, the popular estimates of unemployment are greatly exaggerated, owing to the inclusion of the shiftless and chronic poor, and to the inaccurate methods of enumeration. The most important statistical sources relating to unemployment in ordinary years are the following: (1) Returns from trade unions, as, for example, those published monthly by the Labor Department of Great Britain in the *Labor Gazette*, and in the ***Annual Abstract of Labor Statistics***, beginning with 1887; by the Labor Department of France since 1894, and of Belgium since 1895; in the United States by the Labor Bureau of New York in its quarterly bulletin (Albany), beginning with 1897, and more recently by the American Federation of Labor in its monthly publication, the ***American Federationist*** (Washington). Those records are limited as a rule to well-organized trades, and consequently do not throw light on the amount of unemployment in industry as a whole. Again, in ordinary times the best organized trades are inclined to underestimate the numbers of unemployed for fear that employers will seize the opportunity to lower wages. The English trade union returns clearly show the seasonal character of the building trades, and that in the engineering and metal trades unemployment is cyclical. (2) Returns from manufacturers, as published annually since 1886 by the Labor Bureau of Massachusetts and later by the Labor Bureaus of New Jersey, Connecticut, and Wisconsin. These statistics indicate the number under employment in manufacturing establishments in each month of the year, but do not show the number of those desiring employment. In Massachusetts, returns from 4397 establishments in 1893 showed that in April of that year 319,818 persons were at work, and in September 248,404, or only 78 per cent. of the number employed in April. (3) Census returns, as in the Massachusetts censuses of 1885 and 1895, the Rhode Island census of 1895, and the Pennsylvania census of 1895. The United States census of 1890 on this point proved a failure. The census of Massachusetts in 1885 showed that 70 per cent. of the working population were continuously employed, and that 30 per cent. were unemployed a month or more. The year 1885, however, was one of industrial depression. The Rhode Island census of 1895 showed that on the average 5.8 per cent. of all workers were unemployed at a given time, the maximum amount being 7.3 per cent., in February. In Germany two censuses were taken in 1895, on June 14th and December 2d. The first returned 292,678 unemployed out of a total of 15,497,000, and the other 762,668. (4) Special investigations, as by the Massachusetts Bureau of Labor in 1878, by the Massachusetts Board to Investigate the Subject of the Unemployed, in 1894, by Parliamentary Commissions in Great Britain, and by the French Labor Bureau in 1896. In this category may also be included the police censuses undertaken by municipalities, as that of Boston in December, 1893, and of Brooklyn in February, 1894. These special inquiries have generally been made in periods of industrial distress, and frequently in winter months, when there is always a large number of unemployed owing to seasonal causes. In addition to these direct inquiries fragmentary data may be found in the reports of public poor departments and charitable societies, especially when a record is made of the causes of destitution. Care must be taken to distinguish between new applications and the total number, in order to avoid duplication. Of some service also are the records of employment bureaus and registry offices. Statistics of such offices, however, are not statistics of the unemployed alone; they are rather statistics of the labor market, that is, of the offer and demand for labor, for a certain percentage of those who register have positions and file applications simply in the desire to change.

The remedies which have been proposed for the relief of unemployed are of two kinds, those which are especially applicable in times of emergency and those which are permanent in their operation. In the administration of emergency relief perplexing difficulties are met, for it is easy to transmute unemployment into voluntary idleness. Discrimination must be shown, first, in the selection of the persons to whom relief work is to be given; second, in the choice of work to be undertaken; and, third, in the organization of the agencies by whom the relief work is to be administered. It is difficult to separate the worthy from the unworthy, and to prevent the influx of the unemployed from outside districts. The abuses occasioned by lax methods of procedure are well illustrated by the 'soup kitchens' and bread carts in American cities in 1873, and by the indiscriminate distribution of the Mansion House Fund in London in 1886. Efforts were consequently made to develop a wiser policy in the relief work of each country in 1894. It is now generally agreed that emergency funds as far as possible should be restricted to those who in ordinary times are habitually at work, to those personally known, and to those who are willing to accept less wages than customary, or to work fewer hours per day or fewer days per week, so as to prevent refusal to work elsewhere under ordinary conditions. In brief, there must be investigation and some sort of test; and the shiftless and chronic poor are to be left to the ordinary methods of relief. The choice of kind of work constitutes the most difficult phase of the relief problem. Skilled and unskilled laborers alike must be provided for. The principles adopted by the Local Government Board of England in 1893 in the selection of work were as follows: (1) Work which does not involve the stigma of pauperism; (2) work which all can perform, whatever may have been their previous vocations; (3) work which does not compete with that of other laborers at present in employment; and (4) work which is not likely to interfere with the resumption of regular employment in their own trade by those who seek it. In accordance with the foregoing principles, municipalities were advised to undertake spade industry on sewage farms, the laying out of open spaces, recreation grounds, and new cemeteries, the cleansing of streets not usually undertaken by local authorities, the laying out and paving of new streets, and the extension of sewerage work and works of water supply. These forms of work, however, do not meet the needs of all—the experience of cities and towns in the United States in 1894 showed that many mill hands and artisans were physically unable to endure out-of-door work in the winter or during inclement weather—and, of course, women are not provided for. As yet no satisfactory scheme which will meet the capacities of all has been suggested; the most that has been done is provision for the less skilled laborers who on the whole are less provident and less able to meet unexpected strains.

The agencies to relieve distress among the unemployed are of five classes: First, special citizens' relief committees, organized primarily to aid the unemployed; second, municipal departments having charge of public works upon which it is possible to give employment; third, labor organizations giving aid either by the usual out-of-work benefits or by extraordinary methods; fourth, private charities, including all permanent relief-giving organizations not connected with State or municipal governments; fifth, the permanently established relief agencies administered for the State and for municipalities, such as poor departments. No one of these agencies is complete in itself. The organization of a special relief committee is too apt to be delayed until suffering has been acute, and its methods are likely to be ill-considered if not injurious to society. The undertaking of new public works by municipalities is liable, in the present stage of political development, to be uneconomical, and possibly demoralizing to the civil service. Its virtue is that it may have less of the demoralizing taint of charity. Trade unions cannot make work, and generally oppose any reduction in the standard rates of wages in fear that they cannot recover the concession except by prolonged struggle. Nor do they possess adequate funds to meet extraordinary demand. Private charities are hampered by the cautious, and to able-bodied workmen often irritating, methods of investigation which must govern the ordinary administration of charity; and there is a natural objection on the part of laborers to receive official aid when it is accompanied by what is termed the stigma of pauperism. Illustration of the work of all these agencies may be found in great detail in the *Report of the Massachusetts Board to Investigate the Subject of the Unemployed,* made in 1895, and in the *Report on the Agencies and Methods for Dealing with the Unemployed,* made by the Labor Department of the Board of Trade of Great Britain, in 1893.

The more permanent agencies which have been recommended for the relief of unemployment are as follows: (1) Publication at frequent intervals by responsible authorities, either trade or governmental, of the condition of the labor market, for the purpose of assisting workmen who seek employment, and of preventing an excessive migration from the country into the city. (2) The establishment of employment bureaus and registry offices in order to bring employers and laborers together more promptly. Neither of these agencies can greatly increase the amount of work to be performed; they do, however, reduce loss of time and futile effort. (3) Establishment of boards of conciliation and arbitration in order to prevent strikes and lockouts, which throw men out of work. (4) Adoption of a shorter day of work, so as to give opportunity of employment to a greater number of workmen. This recommendation, however, does not take into account the results of past experience: either the productive power of those working is proportionately increased by the reduction in hours, or the cost of production is increased, thus diminishing the purchasing power and standard of comfort of those dependent upon that particular product. (5) Restriction of immigration. In some industries, as the garment-making trade in the cities of the Atlantic seaboard, and the mining industry in Pennsylvania and Illinois, there has undoubtedly been a congestion of labor owing to an excessive influx of workmen from foreign countries; the restriction of immigration, however, involves so many consequences entirely apart from that of regularity of employment that its discussion must be omitted. (6) Establishment of labor farms or colonies for the purpose of training workmen for agricultural life. The most notable of these experiments are the Labor Colonies of Germany; that of Hadleigh, in England, established by the Salvation Army; the Jewish colonies in Alliance and Woodbine, New Jersey; and certain land settlements in New Zealand. Nearly every country, moreover, has experimented along this line, but the results are not as a whole encouraging. It is undoubtedly one of the methods to be utilized, but it appears to be unfitted to serve as a complete remedy. Agricultural labor is not highly paid, and during the past half century has been subjected to enormous strains caused by the opening up of new markets of supply. Nor can it be expected that a miscellaneous collection of workmen taken from the city will succeed in entirely new pursuits upon the land. Again, urban workmen who have been unused to farm life are likely to be attracted by numerous associations to the charm of city residence. Success can be hoped for only when the colonists are inspired by an earnest spirit, can settle upon land of especially favorable quality, and are supplied with a considerable amount of initial capital. (7) Insurance against unemployment. This has been tried in a few towns in Switzerland, as Bern, Saint Gall, and Basel. In Bern the insurance is voluntary; in Saint Gall compulsory. In each the enterprise is undertaken by the municipality. The scheme adopted in Bern in 1893 provides for the payment of monthly dues of 40 centimes, to which the town adds a small subsidy of 5000 francs. The value of the out-of-work benefit is one franc for unmarried, and one and a half franc for married men, per day. Relief is granted only during the winter months. The Swiss projects have been in operation for too short a period to justify any conclusion as to their applicability elsewhere on a large scale. It may, however, be seriously doubted whether any employment is a sufficiently regular phenomenon to admit of actuarial calculations as is the case with death, sickness, and even accidents. (8) The extension of State industrial enterprise. This in particular is the remedy offered by the Socialists. (See SOCIALISM.) (9) Industrial education. Opposed to the Socialist is the individualist who lays stress upon individual training by which the workman will be enabled to turn quickly from one employment to another in case of displacement. It is held that industrial evolution has proceeded at so marvelous a rate that it is impossible to avoid disturbance. Distress can best be met by a thorough preparation of the individual and the adoption of such measures as will tend to strengthen individual effort and to widen individual opportunity.

UNGA'VA. An unorganized Territory of the Dominion of Canada occupying the peninsula of Labrador with the exception of the southern portion, which belongs to Quebec, and the Atlantic coast region, which constitutes the Newfoundland Territory of Labrador (Map: Canada, Q 5). The boundary of the latter Territory is undetermined, but that of Quebec is formed by the East Main and Hamilton rivers. The area of Ungava is estimated at 456,000 square miles. Ungava occupies of the interior plateau of Labrador a tableland having an average elevation of 1000 to 2000 feet, and composed almost wholly of Archæan gneisses and granites, with some ancient Paleozoic, mainly Silurian, sedimentary rocks. In the northwest the land sinks to an altitude of 500 feet, and the shores of Ungava Bay, as well as portions of the Hudson Bay coast, are low. At Cape Jones, at the entrance to James Bay, and at several other places the plateau approaches the coast. The surface of the plateau is an undulating plain scoured by glacial action, so that the rounded granite surfaces are exposed, surrounded by marshy depressions. Postglacial river systems have not yet developed definitely, and the whole interior is a maze of surface streams and shallow lakes, the latter being so numerous that fully one-third of the total area is covered with water. The streams, however, finally collect in a number of main rivers, which have cut deep valleys in the edge of the plateau, through which they descend to the coast by falls and rapids.

In the southern part of Ungava are large forests of spruce and birch extending northward in the valleys as far as the fifty-seventh parallel, north of which the country is treeless, though there is an area of scrub where gooseberries, currants, huckleberries, and cranberries are abundant. The vegetation in the northern half consists of sphagnum bogs with sedges and Arctic flowering plants, followed in the extreme north by tundras, in which lichens, especially reindeer moss, are predominant. Large animals are not numerous, though deer inhabit the southern forests, and reindeer the northern tundras, while foxes, otters, and beavers are also found. Large flocks of wild geese and other water fowl frequent the lake region, which is also a prolific breeding place for mosquitoes. The climate of the interior is rigorous. The lakes and streams are frozen from October to June, and the temperature sometimes falls to —60° F. The mean temperature of the short summer is 55°. Large areas of iron ore are known to exist, and there are indications of gold, copper, and nickel. The population in 1901 was 5113, almost wholly of roving bands of Indians, who live by hunting. They are partly civilized, and many of them are Christians. Ungava was constituted a Territory in 1897, and is administered by the Dominion Government. The interior was practically unknown until its exploration in 1892-94.

UNGER, ōōng'ẽr, FRANZ (1800-70). An Austrian geologist and botanist, born in Styria. He became in 1836 professor of botany at Gratz, and in 1850 was called to Vienna. His principal works are: *Anatomie und Physiologie der Pflanzen* (1855); *Botanische Streifzüge auf dem Gebiete der Kulturgeschichte* (1857 et seq.); *Sylloge Plantarum Fossilium* (1860); *Die fossile Flora von Kumi in Eubœa* (1867); and *Geologie der europäischen Waldbäume* (1869).

UNGER, JOSEPH (1828—). An Austrian jurist and statesman. He was born in Vienna; studied law in that city, and after holding a professorship at Prague became a professor of jurisprudence in the University of Vienna in 1857. He was greatly interested in the constitutional questions of Austria, and in collaboration with Fischhof, published *Zur Lösung der ungarischen Frage* (1861). He became a member of the Lower Austrian Diet in 1867, and later of the Reichsrat, where he was active on behalf of the liberal programme. In 1869 he was called to the House of Peers. From 1871 to 1879 he was a Minister without a portfolio, and in 1881 became the president of the Imperial Court. His chief work, an attempt to systematize the Austrian private law, was published under the title of *System des österreichischen allgemeinen Privatrechts* (1856-59). Among his other works are: *Das österreichische Erbrecht* (1864); *Der Entwurf eines bürgerlichen Gesetzbuches für das Königreich Sachsen, mit besonderer Rücksicht auf das österreichische allgemeine bürgerliche Gesetzbuch besprochen* (1853); *Die rechtliche Natur der Inhaberpapiere* (1857); *Die Verlassenschaftsabhandlung in Oesterreich* (1865). With Glaser and others, he published *Sammlung von civilrechtlichen Entscheidungen des k. k. obersten Gerichtshofes in Wien* (1859-92).

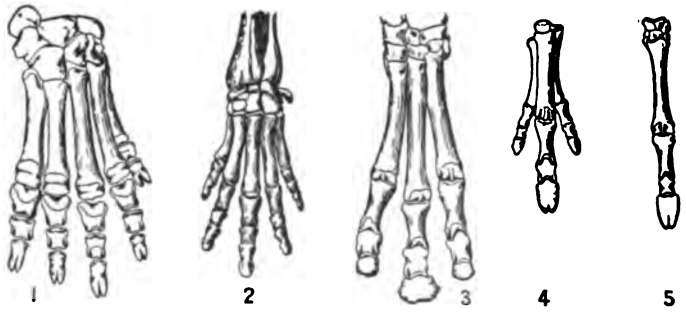
UNGER, WILLIAM (1837—). A German etcher, born in Hanover. He was a pupil of Josef von Keller in Düsseldorf and of Thäter in Munich. In 1872 he went to Vienna, where he became professor in the school of industrial arts in 1881, and at the Academy of Fine Arts in 1895. He became the foremost champion of reproductive etching in Germany—indeed, in Europe—reproducing the great masterpieces of the galleries at Brunswick, Cassel, Haarlem, Amsterdam, and especially at Vienna, where his principal work was published under the title *Die k. k. Gemäldegallerie in Wien*, 175 plates with text by Lützow. Consult Graul, *William Unger und sein Radierwerk* (Vienna, 1891).

UNGUENT (Lat. *unguentum*, from *unguere*, to anoint; connected with Skt. *añj*, to anoint, smear), or OINTMENT. A medicament for external application, consisting of a fatty base holding in it an active agent. The base consists of prepared lard, prepared suet, or olive oil or almond oil, mixed with white wax, or of vaseline, or of lanoline. There are 26 unguents official in the United States Pharmacopœia. The best known of these are *unguentum aquæ rosæ*, or 'cold cream;' *unguentum zinci oxidi*, so widely used for simple ulcers; *unguentum belladonnæ*, often used to allay pain; *unguentum diachylon*, with the virtues of lead plaster; and *unguentum acidi carbolici*, used largely in domestic practice to prevent infection of simple ulcers. See OINTMENT.

UNGULATA (Lat. nom. pl., having claws or hoofs, from *ungula*, claw, hoof, diminutive of *unguis*, Gk. *ὄνυξ*, *onyx*, nail, veined gem, onyx, thickening in the cornea of the eye, OIr. *inga*, nail). An order of mammals, including the elephants, hyracoids, hoofed animals, and related forms of the past; the ungulates. The earliest known forms from the basal Eocene have many resemblances to the Creodonta or primitive Carnivora in the small brain, the dentition, the comparatively short legs and long heavy tail, and the pentadactyl foot. However, it may be that the resemblance to the creodonts is only a parallelism, in that both these groups have retained primitive characters inherited probably from the still earlier Insectivora Primitiva, from which it seems likely both these groups have sprung.

LEFT FOREFOOT OF CORYPHODON (AMBLYPOD TYPE).

The tendency of the group is very early shown in the development of a true herbivorous type of tooth, and a type of limb adapted to running. The oldest forms have the foot plantigrade or nearly so, but the change through the semi-plantigrade and digitigrade to the unguligrade foot, with only the terminal phalanx resting on the ground, is rapid. Also in the earliest forms all the five digits were about equally functional, but began very early a specialization in two directions—the mesaxonic type with the axis of the foot in the third or middle digit, as in the perissodactyl or odd-toed forms, and the paraxonic type with the axis between the third and fourth digits as in the artiodactyl or even-toed forms. The connecting links between the great groups of ungulates have not yet been well established. The Condylarthra, represented by the Lower Eocene Phenacodus, seem to be the most primitive, and it is the general opinion that the other groups have descended from some very early condylarth. The ungulates undoubtedly began to radiate in the Cretaceous, for, though none have yet been recorded for that formation, there are two well-marked groups, the Condylarthra and the Amblypoda, in existence at the very base of the Eocene; the Amblypoda specialized into the clumsy and bizarre uintatheres (see UINTATHERIUM) and both groups became extinct before the end of the Eocene period. The radiation of ungulates continues through the Eocene, and during this period all the great groups become well differentiated. Of the Perissodactyla the Palæotheriidæ, Equidæ, Tapiridæ, Lophiodontidæ, and Hyracodontidæ appear in the Lower Eocene, the Titanotheridæ and Amynodontidæ in the Middle Eocene, and the Rhinocerotidæ in the Upper Eocene. The great expansion of this group is in the Upper Eocene and Oligocene. The Proboscidea and Hyracoidea probably arose, at the latest, in the Upper Eocene. Besides these forms, which were common to most of North America and Eurasia, there arose in South America an ungulate fauna found nowhere else, consisting of the three groups Litopterna, Typotheria, and Toxodontia. These seem to be entirely unrelated to other ungulates except possibly to the Condylarthra. They flourished in the Miocene and Pliocene and became extinct in the Pleistocene.



EVOLUTION OF THE FOOT IN UNGULATES.

1, Homalodontotherium (lower Tertiary); 2, Hyracops (Eocene); 3, Theosodon (lower Tertiary); 4, Proterotherium (lower Tertiary); 5, Thoatherium (lower Tertiary).

The ungulates are from the standpoint of human economy the most important, and have been the chief support of mankind since he attained supremacy, furnishing him with most of the food, clothing, and working assistance which he derives from animals. The four existing suborders are the Hyracoidea, Proboscidea, Artiodactyla, and Perissodactyla. See HYRAX; ELEPHANT; PROBOSCIDEA; RUMINANT; BOVIDÆ; HORSE; RHINOCEROS; and the names of allied groups and species. Consult: Beddard, *Mammalia* (London, 1902); Woodward, *Vertebrate Palæontology* (New York, 1898); and the recent literature therein cited.

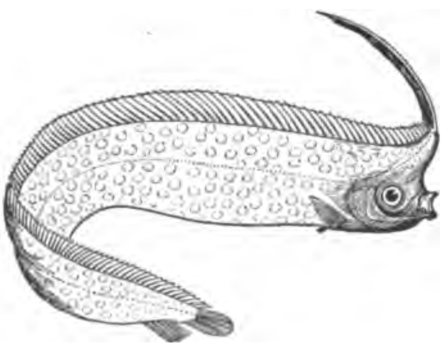
UNGULED. In heraldry (q.v.), a term applied to the tincture of the hoofs of an animal. Thus a stag represented with hoofs of a certain color is unguled of that color.

UNGVÁR, ụng'vär. A town of Hungary, capital of the County of Ung, 172 miles northeast of Budapest, on the river Ung, and on the Nyiregyháza-Ungvár Railway (Map: Hungary, H 2). The former castle is now a seminary. The manufacture of pottery and vine culture engage the people. The population, in 1900, was 14,723, mostly Magyars.

UNIATES (Russ. *uniyatŭ*, member of the United Greek Church, from Lat. *unus*, one). A generic term used to designate several bodies of Eastern Christians, who, while in communion with Rome, are allowed to retain a number of their traditional local peculiarities in discipline and worship. As a rule they have their own liturgies in the Eastern tongues, not in Latin; they use leavened bread in the Eucharist (with the exception of the Maronites and the Armenians); their priests are allowed to marry once; and they have a body of canon law of their own, partly consisting of ancient conciliar decrees and partly of Papal decisions made for their special case. Their government is cared for by a special committee of the Propaganda *super negotiis Orientalium* organized by Pius IX. in 1862. The United Greeks may be divided according to the languages employed in their worship. Those with a Greek liturgy are found principally in Greece, European Turkey, Italy, and Russia, besides some 10,000 adherents in the United States. The Melchites (q.v.) employ the Arabic. There are also Rumanians with a vernacular liturgy; the Slavic is employed by the Ruthenians and Bulgarians. Under the name of Uniates are also comprehended the United Copts, descendants of the ancient Egyptians in Egypt and Abyssinia, the old Patriarchate of Alexandria; they have been united with Rome since 1732, and number some 30,000. To the Syrian rite belong the Maronites (q.v.), the Syrians proper in Asiatic Turkey, and some Syro-Chaldeans in the same region and in India. There are also Armenians in Turkey, Egypt, Russia, and Galicia; these returned to communion with Rome in the first half of the fourteenth century, and now number 150,000.

UNICORN (OF., Fr. *unicorne*, from Lat. *unicornus*, one-horned, from *unus*, one + *cornu*, horn). A fabulous animal mentioned by ancient Greek and Latin authors as a native of India, and described as being of the size of a horse, or larger, the body resembling that of a horse, and with one horn of a cubit and a half or two cubits long on the forehead, the horn straight, its base white, the middle black, the tip red. The body of the animal was also said to be white, its head red, its eyes blue. It was said to be so swift that no horse could overtake it. The unicorn is perhaps best known as a heraldic charge or supporter. Consult: Brown, *The Unicorn* (London, 1881); Gould, *Mythical Monsters* (London, 1886).

UNICORN-FISH. (1) A marine fish (*Lophotes cepedianus*), related to the oarfish and ribbon-fishes (qq.v.). It has been taken both in the Eastern Atlantic and off the coast of Japan, in rather deep water. It is about five feet long and silvery in color, with lighter spots and rosy fins. All the fins are minute except the dorsal, which extends the whole length of the back, and is preceded by the elevation of the crown of the head into a high crest, surmounted by an exceedingly long and recurved spine, from which the fish receives its name. Its habits are unknown. (2) One of the filefishes (*Alutera scripta*) common in the West Indies, and known there as 'lija trompa.' It is two or three feet long, olivaceous in color, streaked and spotted with blue and black, and has the snout produced, and a long and slender spine rising from the top of the head. Consult Günther, *Study of Fishes* (Edinburgh, 1880).



UNICORN-FISH.

UNICORN PLANT. See Martynia.

UNIFORMITARIANISM. In geology the theory which seeks to account for the past history of the earth in the light of the present. It assumes that the great changes which the earth has undergone are the results of slow-working but persistent processes rather than of catastrophic agencies. The theory was first clearly stated by James Hutton and found its ablest advocate in Sir Charles Lyell; it has had an important influence in the development of geological science.

UNIFORMITY, Act of. See Act of Uniformity.

UNIFORMS, Military and Naval. A distinguishing dress or costume (q.v.) appropriate to a certain group or organization, as an army, society, etc. It is necessary to go back to the Crusades to obtain authentic record as to the employment of costume devices. Armor (q.v.), partly because of its expense, but more especially because it was a badge of caste, was the property and privilege of the nobleman. Just as the impossibility of distinguishing one armored knight from another had compelled the adoption of shields, and what are now known as heraldic devices, mottoes, etc. (see Heraldry), so the difficulty of distinguishing the men-at-arms and followers of a king or nobleman, especially in battle, brought about the introduction of a distinct badge or pattern of dress. In the Second Crusade (twelfth century), for example, the French wore red crosses on the sleeve and the English white. Feathers were first worn in the fifteenth century by the French; cloaks and tabard of arms by military men over their armor. Later, Henry VIII., with characteristic love of pomp, at the siege of Thérouanne, had as a guard six hundred archers wearing white gaberdines and caps, and in 1526 he arrayed the yeomen of his household in red, the first appearance, it is said, of red as the English national color. In the same reign all the soldiers of the King were ordered to wear a blue uniform trimmed with white and a Saint George's cross upon the sleeve. In 1544 an order required "every soldier to have a coat of blue guarded with red cloth and a pair of hose, the right hose to be all red, the left to be blue with one stripe of three fingers broad of red upon the outside of his leg." The cloaks of the cavalry were red. In 1584 sod green or russet was chosen for the Irish service, and in 1585 the English soldiers wore red coats during their service in the Low Countries. During the Civil War uniforms varied according to the colors of the leader under whom the soldier served. Red was the color chosen by King

Charles and Prince Rupert for their bodyguards, but it was not definitely adopted as the English color until Queen Anne's reign. In 1693 the infantry wore gray and the drummers scarlet. By the close of the seventeenth century nearly the whole of the land forces of Great Britain were uniformed in scarlet or blue, varying in the facings only. Helmets appeared in 1812 and the red stripe on the trousers in 1834.

The idea of facings (q.v.) in military and naval uniforms grew out of the custom of pinning back the long coat tails for convenience in action, thus showing the lining of a different color. Epaulets (q.v.) of gold bullion were evolved from the metal shoulder pieces used in armor, and appeared in 1795.

In 1603 James I. ordered all shipmasters to dress in scarlet cloth, but a regular naval uniform was not used until 1746. A group of naval officers who were accustomed to meet at Wells Coffee House, in London, decided to place the question for a dress uniform for the naval service before the King and Admiralty, through the Duke of Bedford. The colors suggested were red and blue, the national colors, but the King preferred blue with white facings, which was adopted. Patterns of these earliest uniforms are to be seen at the United Service Institution, London. Under William IV. the naval colors were blue with red facings, and under Queen Victoria and King Edward as originally, blue and white.

Uniforms were first worn in France by the entire army in the reign of Louis XIII. Under Louis XIV. regiments were distinguished by the colors of their colonel. In 1670 Louvois by proclamation made the wearing of uniform compulsory in the army, and gave definite instructions as to its details. The infantry were ordered to wear white coats faced with red, white waistcoats, and white breeches. The officers' uniforms were distinguished by difference in material and trimmings of gold lace. A small cap was worn with this uniform. The cavalry had similar uniforms, but with leather breeches, plumed hats, and high boots.

De Choiseul modified these uniforms in color, making the infantry wear white, the cavalry blue, and the dragoons green. Under Louis XVI. the regiments were divided into six classes, distinguished by the color of the facings. With the French Revolution uniforms were simplified, and consisted of long blue coats, breeches, and high gaiters. Powder and queues were prohibited, but this order was not strictly enforced. Napoleon attempted, on account of the difficulty and expense of procuring indigo dye, to restore the original white uniforms, but, a substitute for this dye having been found, the blue coat was retained, though shortened. A sleeved waistcoat, trousers, and a shako helmet were added to the uniform. In 1815 the white uniform was again taken up, but gave way to the blue in 1820. In 1843 the tunic became almost a waistcoat, and a long gray cloak for protection against cold and wet was brought into use. The trousers were loose and confined by gaiters at the knee; belts were worn round the waist instead of over the shoulder.

The dress of the United States Army prescribed in orders has been marked in practice by irregular and unauthorized modifications. This has arisen partly from the American tendency to sacrifice ornament to utility, and to the want of a suitable dress for field service, in which the troops have been almost constantly engaged since the formation of the Government. During the Revolution it became necessary at times to call upon the inhabitants to contribute cast-off clothing to cover the nakedness of the patriot army; yet efforts were made to establish some degree of military uniformity. Thus in 1777 the Commissioners at the Court of France were "directed to use their utmost endeavors to send, without delay, 80,000 blankets, 40,000 complete suits of clothing for soldiers, of green, blue, and brown colors, with suitable facings and cloth of the same colors, with trimmings sufficient for 40,000 suits more, and 100,000 pairs of stockings fit for soldiers."

In 1780 it was announced that "the different military ranks should be distinguished from each other"—"major-general to wear a blue coat with buff facings, two epaulets with two stars upon each" and "a black and white feather in the hat; brigadier-general, the same as major-general, with one star; captains one epaulet on the right shoulder and lieutenants one on the left shoulder; staff officers to be distinguished by hat feathers of various colors." In 1782 it was ordered "that the uniform of the American cavalry and infantry shall in future be blue ground with red facings and white linings and buttons." The close of the Revolution found the troops, generally, in a condition as to uniform not unlike Falstaff's recruits.

In 1794 the green coat of the cavalry was changed from white to black facings, a leather helmet with black horse-hair plume, and leather breeches. In 1802 Jefferson ordered the French leather cap with a strip of bear-skin on the top; officers of artillery wore gold and of infantry silver epaulets; the coat was a cutaway showing the waistcoat; the infantry wore double and the cavalry and artillery single cross belts; the gorget worn during the Revolution was replaced by a single oval brass plate on the belt. Prior to 1801 the hair was worn tied in queues, but in that year General Wilkinson ordered the hair cut short; the length of whiskers was limited to the bottom of the ear and beards were not allowed until 1853. In 1808 general officers were required to wear single-breasted coats, with very high collars embroidered in gold. In 1810 all coats were single-breasted without facings, and there was worn that remarkable head-dress, the civilian 'silk hat' with a pompon prescribed, which had but a short life. In 1812 the changes were the abolition of the sash, boots for all mounted officers; in 1814 the cocked hat was succeeded by the black leather bell-crowned shako of the French Army; on social occasions, knee-breeches and shoes were permitted with yellow knee-buckles.

In 1821 chapeaux bras were ordered for all but company officers, who continued to wear the bell-crowned cap; captains wore a chevron above the elbow on each arm; subalterns, one below the elbow. In 1825 a blue cloth shako or high forage cap was prescribed, each arm of service being distinguished by the color of the pompon; light artillery, yellow with red top; light infantry, white with red top. In 1835 colored facings were revived; general officers had double-breasted coats with lapels, with buff facings. In

1857 the large black felt hat, turned up at one side, with an ostrich feather curled around the crown, appeared; this was the dress hat until the close of the Civil War. Divested of the feather, it became the campaign hat of the period and the ancestor of the drab felt service hat of 1898-1903.

At the beginning of the twentieth century the question of uniform has become almost as important in its relation to military success as is the rifle or ammunition. The difficulty of crossing the fire zone of the modern rifle demands that the troops thus engaged be uniformed as inconspicuously as possible; but, in the universal effort to attain this result, the nations are practically adopting the same type of uniform, and the same color of material. The great disadvantage of this was frequently seen in the Boer-British War of 1899-1902, when the British troops were sometimes unable to distinguish groups of the enemy from similar bodies of their own forces, owing to the fact that both sides employed Khaki uniforms.

Uniforms of this material came into use about 1880 in the British-Indian Army. At first the Khaki dye was not fast color, and regiments on parade presented a somewhat mottled appearance. In 1884 two Englishmen named Lemann and Gatti secured a fast dye and thus obviated the difficulty. This dye is used equally well for cotton or woolen materials, an important factor in view of service in different climates. In 1885 Lord Roberts investigated the matter and ordered accoutrements, gun wheels, and carriages to be painted in the Khaki color. With the helmets or turbans, haversack covers, and water bottles as well as the uniforms, in this dull shade, the soldier is practically invisible in the field. It was decided to do away with the distinguishing marks of officers in the field on account of the great losses among them in the South African War, but the difficulty of inaugurating any changes in the uniforms of the British Army stands in the way of any radical reform. For instance, in the Boer War the Highland regiments consented to wear Khaki helmets and jackets, but refused to give up their kilts. Similarly, every regiment in the British Army possesses its own traditions and privileges. These privileges are regarded as inalienable rights, and as they conduce very strongly to esprit de corps, they have a value which in a degree offsets the strictly utilitarian views of the War Office.

The service uniforms of the armies of the military powers are now selected primarily for their usefulness under actual war conditions but the main characteristics of the ordinary uniforms are indicated in the following summary:

AUSTRIA. *Infantry*, a frock of dark blue cloth, the collar bearing patches with the regimental colors. *Rifle regiments*, light gray. The *Bosnian infantry* wear a frock coat of light color. *Cavalry: Dragoons, Uhlans*, wear a single-breasted tunic of light blue cloth. *Hussars*, light and dark blue. The various regiments are distinguished by their head-dress or the color of their facings. The dolman is of the same color as the tunic, is lined with fur, and has a black astrachan collar. *Engineers*, light blue.

ENGLAND. *Infantry*, generally scarlet. *Rifle regiments*, dark green. The Royal regiments and guards are distinguished by their dark blue facings. *Cavalry*, scarlet or blue. *Artillery*, blue with scarlet facings. *Engineers*, scarlet with blue facings.

FRANCE. The radical change which took place in 1903 was largely due to General Andrée. Instead of the red full trousers and double-breasted coat, a tunic of dark Prussian blue cloth with a single row of buttons is worn. The trousers are of dark bluish gray. The head-dress consists of a large, broad-brimmed felt hat, looped up at the side with a red, white, and blue cockade, somewhat similar to those worn during the Directory. The only decorative portion of the uniform is the red epaulets. *Cavalry, cuirassiers*, and *dragoons* wear a dark blue tunic, with the number of the regiment marked on the collar. *Artillery*, dark blue tunic and scarlet facings. *Engineers*, dark blue tunic, scarlet facings, and dark blue trousers.

GERMANY. *Infantry*, single-breasted dark blue tunic with scarlet facings, the Guards regiments being distinguished by the lace on their cuffs. *Rifle regiments* wear dark green tunics with scarlet facings and a leather shako. *Cavalry, cuirassiers*, and *dragoons*, metal or leather helmet, white or light blue tunics. The *hussars*, tunics of various colors, dark blue breeches, fur busbies, Hessian boots, and gray cloaks. *Lanciers*, lancier caps, dark blue tunic (Bavarians, dark green), dark blue breeches, long boots, gray cloaks, and white belt. *Artillery*, dark blue tunics, black facings. *Saxon regiments* wear dark green tunics with scarlet facings. *Engineers*, dark blue tunic, with black facings, white buttons, and scarlet shoulder straps. Early in 1904 the field dress of the German Army was changed in color and material like that now worn by the United States Army. See below.

ITALY. *Infantry*, dark blue tunic, gray trousers. *Cavalry*, dark blue tunic and light gray trousers. *Artillery*, same tunic as cavalry, but with yellow edging and dark blue trousers.

RUSSIA. *Infantry*, green tunic fastened by hooks instead of buttons, loose-fitting for men. No facings are worn, but a line of red piping goes around the top of the collar. Trousers, green with red facings for officers; men, green, without facings. Knee boots are worn, into which the trousers are tucked. Grenadiers wear the same uniform as the infantry except that the shoulder straps are always yellow and the regimental number on the cap is followed by the initial letter of the word grenadier. The infantry of the Guard wear a tight-fitting tunic, with facings of white, red, or orange, according to their divisions. *Cavalry, grenadiers*, and *dragoons* wear green tunics with two rows of buttons, facings of red on collar and sleeves. The trousers are of gray cloth, with red stripes for the Guard only. The uniform of the Cossack troops generally consists of a coat hooked obliquely across the chest, with facings of red, blue, or yellow, according to the regiment. The trousers are of blue cloth, with wide red stripes; boots to the knee, and black sheepskin cap, with a red top. The Cossacks of the Caucasus wear the Caucasian dress of a dark gray coat under which is partly exposed a white waistcoat, full gray trousers tucked into the boots, and high round caps of sheepskin. Artillery uniforms are modeled after the infantry and cavalry.

JAPAN. The Japanese artillery, infantry, and cavalry wear the same style of uniform, except that the facings for cavalry are green, artillery yellow, and those of the infantry red. The winter uniform is dark blue, and the summer uniform white. The campaign uniforms adopted in 1903 are of Khaki, and are modeled after the British and German types.

UNITED STATES. An important and radical alteration in the uniform of the United States Army was made in 1902. It comprised the adoption of 'full dress,' 'dress,' and 'service' uniforms (with summer and winter additions); the helmet was abolished and a cap, shaped somewhat like the British officers' forage-cap, was substituted; minute adherence to details and strict observance of times and places or 'occasions' when each kind of dress was appropriate were enjoined. In the new dress, the results of the experience of all nations as to utility and ornament were combined.

For all uniforms excepting overcoat and 'service dress' the traditional color—dark blue—was retained with facings or piping of red, yellow, and white for the artillery, cavalry, and infantry respectively. For the staff corps and departments colors for facings, etc., were prescribed as follows: Scarlet piped with white for the engineers; orange piped with white for the signal corps; black piped with scarlet for the ordnance department; maroon for the medical corps; and buff for the quartermaster's department. The overcoat was an 'ulster' of a yellowish-brown color. The chapeau was discarded for all purposes save 'full-dress—dismounted' for generals and officers of the general staff. In 1903 a new material of an 'olive drab' shade was adopted for the 'service dress;' all insignia and metal trimmings and buttons were of bronze; and boots and leggings of russet leather were prescribed.

The full-dress coat for officers is double-breasted, with a double row of buttons, and for general officers has a velvet collar. With it are worn epaulets (by general officers) or shoulder knots, while the appropriate insignia for the corps, department, or arm of the service and the rank of the officer are indicated by devices and braid on the collar and cuffs. The dress coat for all officers except general officers is a single-breasted sack coat of dark blue cloth trimmed with black braid, but without brass buttons. Shoulder straps and appropriate corps devices on the collar are worn with this coat. The white coat is similar to the dress coat save that the insignia of rank is placed on the shoulder loop and the shoulder straps are omitted. The general officers' dress coat is a double-breasted sack coat with brass buttons. The service coat of olive drab is a sack coat with outside patch pockets and has the insignia of rank on the shoulder strap and the corps devices on the collar. These with the buttons are of dull bronze. Private soldiers have the same general classes of uniforms. The full dress uniforms are adorned with a breast cord and tassel of the corps, color of the department, or arm of the service, as are the piping of the collar, shoulder loops, and cuff. The trousers of the full-dress uniform are of sky blue with a stripe of the color appropriate to the corps or arm. The cap which replaces the helmet for full dress has a stripe of cloth of the proper color, while it has the appropriate insignia of metal in front. The dress cap has the band removed, while in service the well-known felt campaign hat is worn. The various insignia worn in the United States Army are described in some detail under MILITARY INSIGNIA; CHEVRONS; EPAULETS; etc. The uniform for the cadets of the United States Military Academy (q.v.) is of gray, the service coat being a sack coat trimmed with black braid without buttons, while the dress coat is a swallow-tailed coat with brass bell buttons. The marks of ranks of the cadet officers are chevrons with the points upward.

NAVAL UNIFORMS.

Modern naval uniforms are marked by the same general characteristics throughout the navies of the world, and resemble each other quite closely. This, doubtless, is due to the fact that naval officers and men are universally exposed to the same conditions and that the ceremonies and usages at sea obtain in much the same form under different flags. The uniforms of the United States Navy, described in some detail below, may be considered fairly typical, and the deviations are usually in such details as epaulets, gold lace, insignia, etc., for which each service has its own definite and minute regulations.

The uniform for the British Navy closely resembles that of the United States Navy. For officers there are eight different suits to be worn on specific occasions, classed as follows: Full dress, ball dress, frock coat with epaulets, frock coat, undress, mess dress, mess undress, white undress. The undress uniform differs from that worn in the United States Navy in that it has a double-breasted coat with brass buttons instead of the blouse trimmed with braid. On all the uniforms the distinctive marks of rank are stripes on the sleeves and appropriate devices on the shoulder strap or epaulet. The significant degrees on the latter are as follows: Admiral of the fleet, crown, and crossed cannon surrounded by a wreath; admiral, crown, crossed sword and baton and three stars; vice-admiral, the same, with two stars; rear-admiral, the same, with one star; a commodore or senior captain has a crown and anchor and two stars, while a junior captain has the same with one star; a commander has a crown and anchor, a senior lieutenant a star and anchor, and a junior lieutenant an anchor.

The Russian Navy in its dress resembles the British, but is less elaborate and has some marked peculiarities. Officers (in winter) wear a dark blue frock coat, a reefer jacket, or a monkey jacket; in summer, white. The cap is high, flat-topped, and of the color of the dress worn. Cocked hats are required for full dress. In winter both officers and men wear a brown woolen cape, also goloshes over the boots. The Russian officer out of quarters is always in uniform. The enlisted man in winter wears a short gray overcoat, belted at the waist. On shore duty he wears a military tunic and leggings.

The uniform of officers of the United States Navy consists of three classes—dress, undress, and service dress. The dress uniforms are, special full dress, full dress, dress, evening dress A, evening dress B, mess dress. The undress uniforms are undress A and undress B. Service dress is either blue or white. The special full-dress uniform consists of a double-breasted blue broadcloth coat with standing collar and eighteen gilt buttons, nine in each row; blue trousers with a stripe of gold lace down the outside seam;

epaulets, cocked hat, sword, and full-dress belt. The undress A uniform consists of a double-breasted blue frock coat similar in cut to the civilian's coat, but having eighteen gilt buttons, nine each side, and with shoulder fixtures for epaulets or shoulder-straps (the latter are worn with undress A); a blue waistcoat with seven gilt buttons, cap, sword, plain leather belt, and plain blue trousers. The service suit consists of a blue or white blouse with standing collar and trimmed with black braid; blue or white waistcoat with seven gilt buttons; plain blue or white trousers. The evening dress suit is similar in cut to the civilian evening dress suit, but the buttons are gilt and the coat is fitted with shoulder fixtures for epaulets; the waistcoat may be blue or white as ordered. The mess dress consists of the white mess jacket, cut like the evening dress coat without the tails, white waistcoat, and blue or white trousers.

The various styles of uniform are made up from these. The special full dress is used on occasions of special ceremony. The full dress is used on less important occasions. It consists of the frock coat with epaulets, cocked hat, full-dress belt, and special full-dress trousers. The dress uniform, used for particular official calls, consists of frock coat, epaulets, cocked hat, plain belt, blue trousers. Undress A is used for service on courts-martial, reporting for duty, etc. Undress B differs from undress A only in omitting the sword and belt. It is used for ordinary official and semi-official calls, etc. Service dress is worn at all times when some other special uniform is not provided. The mess dress is worn at dinner when ordered.

On all except white uniforms the rank of an officer is indicated by gold lace on the sleeve and devices on the collar, epaulet, shoulder strap, or shoulder mark. Ensigns and officers of that rank wear one stripe of half-inch gold lace; lieutenants of the junior grade, a stripe of half-inch lace and a stripe of one-quarter inch lace above it; lieutenants, two stripes of half-inch lace; lieutenant-commanders, two stripes of half-inch lace and a stripe of one-quarter inch lace between them; commanders, three stripes of half-inch lace; captains, four stripes of half-inch lace; rear-admirals, one stripe of two-inch lace and one of half-inch lace above it; admiral, two stripes of two-inch lace and one stripe of half-inch lace between them. All officers of the line or executive branch wear a gold star on the sleeve above the lace. On the overcoat and white service coat the lace is worn on the shoulder marks. The ornaments indicating rank, which are worn on the collar, epaulet, and shoulder strap, consist of the corps device and rank emblem. The former consists of a silver foul anchor for line officers, sprig of silver oak leaves for pay corps, gold oak leaf and silver acorn for medical corps, one silver oak leaf and acorn for professors of mathematics, silver cross for chaplains, two gold live-oak leaves and acorn for naval constructors, and the letters C. E. in silver for civil engineers. The rank emblem for an admiral is four silver stars with a gold foul anchor under the outer ones; for a rear-admiral, two silver stars and a silver foul anchor or other corps device between them; for a captain, a silver eagle; for a commander, a silver oak leaf; for a lieutenant-commander, a gold oak leaf; for a lieutenant, two silver bars; for a lieutenant of the junior grade, one bar. Ensigns and officers of that rank wear only the corps device.

White uniforms are worn in hot weather. The overcoat is of the ulster type with very broad collar and black rubber buttons. Rank is indicated by the shoulder mark. Warrant officers wear no stripes on the sleeve, and no shoulder ornaments. The collar ornaments are crossed anchors for boatswains, a bursting shell for gunners, and a gold chevron for carpenters. When commissioned after ten years' service, chief warrant officers wear a half-inch gold stripe and silver collar ornaments.

The uniform of enlisted men consists of dress, undress, and working dress; each of these may be white or blue. Chief petty officers wear double-breasted blue or white coats with gilt buttons. Other enlisted men wear a blue shirt or white dress jumper for dress, with blue cloth trousers. Undress is merely less neat or new uniform, if blue; but white undress has a white collar instead of a blue one; working dress is old blue or white uniform and is worn without a neckerchief. Rating badges for petty officers are worn upon the sleeve. Chief petty officers wear caps with visors and an ornament consisting of a gold foul anchor; other enlisted men wear round caps with a flat top projecting beyond the band all around the head.

UNIGENITUS. A Papal bull issued in 1713 condemning the principles of Jansenism (q.v.).

UNIMAK, o͞o′nê-mäk′. The largest and easternmost of the Aleutian Islands (Map: Alaska, C 5). It is separated from the southwestern extremity of the Alaska Peninsula by a narrow, very shallow, and unnavigable channel. It is 70 miles long; average breadth, 20 miles. It is barren and mountainous, and contains two volcanoes, one of which, Shishaldin, has an altitude of 8683 feet and is still active. There is a very scant population of Aleuts.

UNIO. The type-genus of the family Unionidæ, which contains the greater part of the fresh-water mussels (q.v.).

UNION. See TRADE UNIONS.

U′NION. A town in Hudson County, N. J., adjoining Weehawken and West Hoboken; on the Erie, the West Shore, and the New York, Susquehanna and Western railroads (Map: New Jersey, D 2). It is of considerable importance as an industrial centre, being interested largely in the manufacture of silk goods. There are also breweries and a shirt factory. Population, in 1890, 10,643; in 1900, 15,187.

UNION. The county-seat of Union County, S. C., 65 miles northwest of Columbia; on the Southern Railway (Map: South Carolina, C 2). It is the commercial centre of a farming and cotton-growing region, which also has large lumber and fruit interests. There are cotton mills, a cottonseed-oil mill, knitting mills, etc. The waterworks and the electric light plant are owned by the municipality. Population, in 1890, 1609; in 1900, 5400.

UNIÓN, o͞o′nē-ōn′, LA. A town of Murcia, Spain, near the Mediterranean coast, five miles east of Cartagena (Map: Spain, E 4). The country is a mineral region, producing iron, manganese, sulphur, and carbonate of lead. The town was founded in the second half of the nineteenth century. Its municipal population in 1900 was 28,479.

UNIÓN, La. A province of Northern Luzon, Philippine Islands (Map: Philippines, E 3). Area, 867 square miles. The province is mountainous and forested, but much land is well cultivated, producing tobacco, rice, cotton, corn, sugar, and cacao, while stock-raising is also important. A telegraph line, as well as the main highroad and projected railroad from Manila to Laoag, runs through the province. Population estimated in 1901 at 110,464, chiefly Ilocanos and Pangasinánes. Capital, San Fernando (q.v.).

UNIÓN, La. A port of the Republic of Salvador and capital of the Department of La Unión, situated at the southeastern extremity of the country, on an inlet of the Gulf of Fonseca, and at the foot of the volcano of Pinos (Map: Central America, D 4). Population, 3000.

UNION CITY. The county-seat of Obion County, Tenn., 100 miles north by east of Memphis; on the Nashville, Chattanooga and Saint Louis, and the Mobile and Ohio railroads (Map: Tennessee, B 4). It is important as a shipping point for farm produce, chiefly wheat, corn, and hay; and manufactures flour, brooms, mattresses, decoy ducks, and foundry and lumber products. The water-works and the electric light plant are owned by the municipality. Population, in 1890, 3441; in 1900, 3407.

UNION COLLEGE. An institution of higher education at Schenectady, N. Y., incorporated in 1795. It was the second college incorporated in the State, and received its name from the coöperation of several denominations in its organization. In 1830 a scientific course was established parallel with the classical course. The first engineering course in an American college was established here in 1845. The progressive policy of Union at this period was due chiefly to the genius of Dr. Eliphalet Nott, president from 1804 to 1866. The college fraternity system originated at Union (1825). In 1873 the Law School and Dudley Observatory in Albany were associated with Union College under the corporate title of Union University, and the Albany Course of Pharmacy was added in 1881. The degrees conferred in course are B.A., Ph.B., B.S., B.E., M.A., and M.S. The students in the college in 1903 numbered 220 and the faculty 24. The library contained 37,325 volumes, the endowment was $534,000, and the income $62,840.

UNION JACK. The combination of the national flags of England, Scotland, and Ireland into a union flag, dating from April 12, 1605, when James I. ordered that the red cross of Saint George on a white field of England should be combined with the white saltire, or Saint Andrew's cross, of Scotland and flown by all British ships. Charles I. restricted the Union flag to royal ships, and on July 28, 1707, a 'red jack (flag) with a union jack' at the upper corner next to the staff was duly prescribed as a merchant ensign. In 1801 the red diagonal cross of Saint Patrick was added for Ireland, being placed with the Saint Andrew's cross, the red and white alternately above. The union jack was originally carried in the maintop, and the separate flags of Scotland and England at the foretop, but it came to be a fundamental part of the national ensign, which in the navy differed in color for the different divisions of the fleet. In 1864 it was determined to use the white ensign for the royal navy, the blue ensign for naval reserve, royal yacht clubs, and various official ships, and the red ensign and the union jack with a white border for the merchant marine, the latter flag being used as a signal for a pilot or as a jack at the bowsprit. The union jack proper is flown at the bowsprit on a jackstaff by British naval vessels, and also occasionally as a personal flag, as at the main-topgallant masthead for an admiral, or at the mizzen-topgallant masthead for the sovereign when abroad, or with the addition of emblems by various other officials. The union jack is also carried as one of the two regimental colors by British regiments. (See Colors.) In the United States the term 'union jack' is applied to a blue flag used by the navy, with white stars similar to the field of the national ensign and flown at a jackstaff at the bow when in port. (See Jack; also Flag, and Colored Plates of Flags.) For an interesting and detailed history of the 'union jack,' see Green, *Archæological Journal* (London, December, 1891); also Hulme, *The Flags of the World* (London, 1897).

UNION LABEL. A trademark or advertisement owned and registered by a trade union and attached to articles of sale, signifying that they have been made in establishments employing union labor only, and under conditions stipulated by the union. The label seems to have been first used by the California cigarmakers about 1874. It appeals with particular force to the more conservative trade-unionists, who praise it as a peaceable and inexpensive way of increasing the power of the unions; they frequently describe it as 'the legal boycott.' Its use is spreading rapidly. The American Federation of Labor in 1903 recognized and indorsed at least 43 labels of different trades and three 'display cards;' while a very large number of unions employ the common label of the American Federation. In most States (32 in 1900) statutes impose penalties for counterfeiting the label or knowingly using a counterfeit. In several trades, e.g. cigarmakers, printing, and the hatters' trade, the label has become a factor of first importance.

UNION LEAGUE CLUB OF THE CITY OF NEW YORK, The. One of the leading social and political organizations of the United States. It was incorporated by the New York State Legislature, February 16, 1865. The qualifications for membership are United States citizenship and absolute and unquestioned loyalty to the Government of the United States. The club has been a stronghold of Republicanism and its influence has been repeatedly exerted for the Republican Party in national and local elections. The number of annual resident members is limited to 1800, and 100 members constitute a quorum at all meetings. The club has quarters at Fifth Avenue and Thirty-ninth Street in New York City, containing a well-furnished library and art gallery. Total membership January 1, 1903, 1866. Similar institutions of the same name and purposes have sprung up in other cities, notably in Philadelphia and Chicago.

UNION THEOLOGICAL SEMINARY IN THE CITY OF NEW YORK, The. A Presbyterian institution founded in 1836, independent of all ecclesiastical control, and open to students of every evangelical denomination. It offers a regular course of three years leading to a diploma, a three and a four years' course leading to the degree of bachelor of divinity, graduate and special courses, and extension courses for lay students. The regular course requires a minimum of 1200 hours of classroom work, 780 in specified subjects, and 480 hours of electives; the three years' degree course demands college graduation, all the work of the regular course, 180 additional hours of classroom work and the attainment of a higher standing than that required for the diploma, attendance upon a 'seminar' for at least one year, a thesis representing original research, and such special and searching examinations as the faculty may prescribe. The four years' degree course requires the regular three years' diploma course taken at this seminary or elsewhere, with advanced standing, and an additional year in residence including 360 hours of classroom work and the other additional items already specified. The seminary offers a number of merit scholarships with incomes of $100-$250, prize scholarships of $300, a limited number of graduate scholarships, and two fellowships of $600 appropriated to the use of incumbents prosecuting special studies for two years either in the United States or Europe. The seminary buildings at 700 Park Avenue contain a chapel, lecture rooms, library, museum, social room, gymnasium, professors' offices, and students' rooms. The library in 1903 contained 80,000 volumes and 33,000 pamphlets. Connected with the seminary are 16 resident professors and instructors and 120 students.

UNIONTOWN. The county-seat of Fayette County, Pa., 44 miles south by east of Pittsburg; on the Pennsylvania and the Baltimore and Ohio railroads (Map: Pennsylvania, B 4). The borough is the commercial centre of a section containing extensive deposits of coal and iron. Its industrial establishments include lumber mills, steel works, a foundry, brick yards, and manufactories of glass, flour, leather, etc. Uniontown was settled about 1767, and was laid out as a town in 1783. It was incorporated as a borough in 1796. Population, in 1890, 6359; in 1900, 7344.

UNION UNIVERSITY. See Union College.

UNION VETERAN LEGION. See Veteran Legion, Union.

UNION VETERAN UNION. See Veteran Union, Union.

UNIO PROLIUM (Lat., union of offspring). In the law of Germany, a form of mutual adoption of children frequently effected when a widower having children marries a widow with children. The parties secure to the children of each by their former spouses the same rights as to succession to property, etc., as any children who may be born to them thereafter.

UNISON (from ML. *unisonus*, having one sound, from Lat. *unus*, one + *sonus*, sound). In music, a tone of the same pitch as another. In this sense the term unison is identical with the interval of the prime. The term has, however, been extended so as to include all parts performing the same melody, even if some instruments play the tones one or two octaves lower than others.

UNIT (formerly also *unite, unitie, unity*, from Lat. *unitas*, oneness, from *unus*, one). A certain fixed quantity employed for measuring other quantities and for stating their magnitude. Ordinarily a unit is the smallest complete measure of value, extension, duration, mass, etc., and when employed in measurement involves repetition and subdivision. An arbitrary unit is one which may be employed in the form of a concrete standard and which is generally available for reproduction. An example of such a unit is the distance between two marks in gold plugs on a bronze bar in the possession of the British Board of Trade, or the British Standard Yard. Similarly the meter of the Archives at Paris (see Metric System) is an arbitrary unit. Fundamental units are those selected arbitrarily on account of the ease with which standards can be constructed or reproduced and from which other units can be derived. In the C. G. S. system (q.v.) the fundamental units are those of length, mass, and time, from which units have been derived for area, volume, velocity, force, work, etc., magnetic units, electro-magnetic units, etc. In certain instances the derived units in the C. G. S. system may be in such shape that they are not available for general use and either a multiple or a fraction must be employed. Such units are known as practical units. Examples of practical units in common use are the ohm, the volt, and the ampere. See C. G. S. System; Metric System; Electrical Units; Mechanical Units; Weights and Measures; Money, etc.

UNITARIANISM. In general, the religious system of all who affirm the unity of God; specifically, the belief of certain free Christian churches and individuals whose religious faith is expressed in the doctrines of "the fatherhood of God, the brotherhood of man, the leadership of Jesus, salvation by character, and the progress of mankind onward and upward forever." The declaration of the National Conference of Unitarian and other Christian churches (American) is: "These churches accept the religion of Jesus, holding, in accordance with his teaching, that practical religion is summed up in love to God and love to man." The most generally accepted covenant of the Unitarian churches reads, "In the love of truth and the spirit of Jesus Christ, we unite for the worship of God and the service of man."

Unitarians do not appeal to the Bible as a final and infallible authority, but they consider that in the prophetic teaching against idolatry, formalism, and all unrighteousness, there is set forth what are now recognized as essential Unitarian principles. They assert that the teaching of Jesus was simply that of one God, the heavenly Father, and they profess to teach what was central and essential in his message. They lay emphasis on the Beatitudes, the Golden Rule, the Two Commandments. They find the way of salvation described in the Gospels, where "purity is set forth as the condition, growth the method, love the motive, character the fruit, and service the expression of eternal life, of the Kingdom of God." Original Christianity, they maintain, was not the acceptance of any formal creed, but the adoption of a spirit like that of Jesus, whom they regard not as a God to be worshiped, but as a divinely prepared teacher to be loved and followed. They point to the fact that the view of Jesus as God, equal to the Supreme Being, was ardently resisted, especially by the Arians, who in the fourth century constituted nearly half of Christendom. (See ARIUS; ATHANASIUS.) The Arian view of Jesus as a separate and subordinate being was widely held by the forerunners of modern Unitarians, but it was not a successful solution of the problem respecting the nature and rank of Jesus. Arianism was declared heresy in the fourth century, and was steadily crushed out by the growing power of the orthodox Church.

Among the earliest movements of the Reformation epoch were some in which we find the seeds of modern Unitarianism. The study of the Bible brought new appreciation of the original teachings of Jesus. The reformers, indeed, carried over into Protestantism many of the characteristics and thoughts of the dogmatic Christianity which they rejected, yet they opened the way to larger interpretations. A definite affirmation of the doctrines now called 'Unitarian' was made at Vicenza in Italy in 1546, when a number of leading scholars of Northern Italy came together to discuss and promulgate their anti-Trinitarian views. They were dispersed or destroyed, and the exiles found refuge in Switzerland, Poland, and Transylvania. In Poland the doctrines taught by these fugitives fell into fruitful soil. The leaders in this movement were two Italians, uncle and nephew—Lælius and Faustus Socinus. The prominence of these men in the movement for a more rational interpretation of Christianity gave to their societies and teachings the name Socinian. (See SOCINUS.) At the close of the sixteenth century there were more than four hundred Socinian churches in Poland. At Rakow there was a Unitarian college with more than a thousand students, and in 1605 there was published the so-called "Racovian Catechism," which is the definite and formal statement of the Unitarian theology of the Reformation period. The bitter hostility of the Roman Catholics and the tacit consent of the orthodox Protestants of Poland united to overthrow the prosperity of the 'Free Brethren.' In 1658, after increasing persecutions, King John Casimir finally decreed the death or expulsion from Poland of all Socinians who would not embrace Catholicism. Thousands were killed and thousands more exiled, until by 1670 all trace of this Unitarian movement had disappeared from Poland.

In 1568 Francis David preached a similar doctrine in the streets of Klausenburg, in Transylvania, and began a movement of far-reaching significance. For a number of years the Unitarian views were disseminated without hindrance among the Hungarians. In the seventeenth century, however, persecutions began. The churches and schools of the Unitarians were confiscated, their printing-presses destroyed, and their lands wrested from them. But such was the tenacity of the people that in spite of two centuries of bitter trial the Unitarian cause survived in Hungary. Not till 1791 did royal decree restore to the Unitarians the free exercise of their religion. A last effort to crush them occurred as late as 1857, but with the help of fellow-believers in England and America the Hungarian Unitarians survived that attack also; and while fewer in number than in the seventeenth century, they are now again increasing.

One other definite landmark among the earlier assertions of the Unitarian spirit must be noted. In 1553 a fugitive Spanish scholar, Michael Servetus (q.v.), printed at Vienne a remarkable book called *The Restoration of Christianity*. In this book he declared that it was not alone a reformation of the Church, but a reformation of principles that was needed, and a return to the pure teachings of Jesus. Servetus was burned at the stake in Geneva in 1553, Calvin consenting, but his books were widely read.

The teachings of Socinus and Servetus found a ready reception in England. The "Racovian Catechism" was dedicated to James I., and attracted so much attention that in 1614 Parliament ordered all copies seized and publicly burned. A little later, denial of the Trinity was made punishable by death. The last persons put to death for religious opinions in England were Unitarians. John Biddle (q.v.), a schoolmaster in Gloucester, was the boldest leader of the early English Unitarians. In spite of persecution, he maintained that "there is no other authorized interpreter of Scripture than reason." Cromwell countenanced and pensioned Biddle; but after the Protector's death he was once more thrown into prison, where he died (1662). The story of Unitarianism in England during the seventeenth century is one of struggling and isolated martyrs. No public organization was possible, owing to measures of repression, but some of the greatest men of the age, such as John Milton, John Locke, and Sir Isaac Newton, recorded their final judgment in favor of the Unitarian interpretation of Christianity.

During the eighteenth century there was a steady broadening of religious thought in England. When the Act of Toleration in 1689 permitted the building of non-conformist chapels, a number of the English Presbyterian churches left their trust deeds 'open' and refused to bind their successors to any definite formularies. Before the end of the eighteenth century many of these churches, without any sudden change, had come to a Unitarian position. They did not take the name, but continued for the most part to call themselves Presbyterian, and some do so still. Joseph Priestley (q.v.), the discoverer of oxygen, was minister of one of these churches in Birmingham. His book on *The Corruption of Christianity* (1782) exerted a wide influence. In 1794 he emigrated to America and, settling in Pennsylvania, established in Philadelphia and in Northumberland Unitarian congregations.

The first church in England established with the definite Unitarian name was organized in 1774, by Theophilus Lindsey, who gave up his living in the Established Church and organized the Essex Street Chapel in London on the site where now stands Essex Hall, the headquarters of the British and Foreign Unitarian Association. To this nucleus slowly gravitated many of the Presbyterian churches already named, and others from the General Baptist Connection, and similar progressive communions. It was not, however, until 1813 that the penal laws against Unitarianism were finally repealed. The British and Foreign Unitarian Association was organized in 1825.

The seeds of the Unitarian movement were brought to America in the *Mayflower*. They were planted wherever a church was organized in New England with a *covenant* instead of a *creed*. It was among the oldest of the Puritan and Pilgrim churches that Unitarianism in America started, and the majority of the original Massachusetts churches followed later the lead of Channing. This development was without abrupt transitions, and did not require any alteration in the broad lines of the first covenants. The Pilgrims' Church in Plymouth, though now for a century Unitarian in fellowship, retains the original covenant by which in Holland the Pilgrims "formed themselves into a Church or State in the fellowship of the gospel to walk together in all His ways made known, or to be made known unto them." The First Church in Salem still retains the covenant of 1628. While the original Puritan churches in New England were rigidly orthodox in theology, the whole atmosphere of the colonial life was increasingly that of freedom. The democratic principles adopted in the State found also expression in the Church, and soon after the Revolution many ministers of the older churches in New England assumed a practically Unitarian position.

In 1787 King's Chapel in Boston, originally an Episcopal church, the first established in New England, modified the ritual of the Church by the excision of the more orthodox and Trinitarian phrases, and ordained James Freeman (q.v.) as minister of the first avowedly Unitarian church in America. In 1805, when Henry Ware (q.v.), known to be a decided liberal, was appointed professor of divinity at Harvard College, the lines were drawn between the orthodox and Unitarian parties in the New England churches. In 1819 William Ellery Channing, minister of the Federal Street Church in Boston, preached at Baltimore a sermon which became famous as the Unitarian Declaration of Independence, and within a year nearly one hundred and fifty Congregational churches in New England had declared their adhesion to Channing's position. (See CHANNING, WILLIAM ELLERY.) In 1825 representatives of these churches united in establishing the American Unitarian Association, and began organic progress as a united religious body. The National Conference was formed in 1865, and the International Council of Unitarian and other Liberal Religious Thinkers and Workers in 1900.

The briefest definitions of the Unitarian faith are such as these: "Christianity as Christ preached and lived it—not faith *in* Jesus, but the faith *of* Jesus;" or "the affirmation of the present life of God in the soul of man;" or "the two great commandments applied;" or "the affirmation of the humanity of God and the divinity of man." Unitarianism is not so much a system of opinions as a habit of mind and a principle of conduct. Unitarians ask no one to sign a creed, because they believe that dogmas are not essential to religious life. What seems to them essential is not a transient form of opinion, but a method of truth-seeking and the practice of righteousness. Unitarians believe in the unity to be discerned in all natural laws and processes; they hold that religion is natural, that faith is a matter not of tradition, but of personal insight, and that the true way to learn of the doctrines is by obeying the will of God.

Unitarians believe in one God, the Father, not in a Trinity of persons in the Godhead. They believe that Jesus is a son of God, not that he is God the son; they recognize him as the great teacher of spiritual truth and the example of the noble life, but they do not accept him as God, the equal of the Heavenly Father. They do not believe in worshiping Christ, but in following him, and they discover no need of a mediator between God and man. Unitarians believe in the Holy Spirit, not as the third person in the Godhead, but as the name for God's spiritual influence in the hearts of men. They consider all men God's children, not merely His creatures, and therefore they declare the dignity, not the depravity, of human nature. The doctrines of the fall of man and of sacrificial atonement have, therefore, for Unitarians no reality or significance. Unitarians believe that the Bible contains the Word of God, not that every word it contains is God's word; they use the Bible as an oracle of the spiritual life to touch the conscience and to draw the soul to God. They hold that salvation is won, not through miraculous substitution, but through the energies of a good life; they hold that fruitfulness is the test of religious vitality. To them heaven and hell are not places of bliss and misery, but states or conditions of the soul; each man making for himself his own heaven or hell and carrying it with him wherever he goes. Unitarians find an adequate basis for religious organization in a common purpose to do good and to be good.

There are in the United States about 460 Unitarian churches, with 554 ministers. In Great Britain and Ireland there are about 400 churches; in Hungary, 125; and the movement is represented by churches and individuals in every civilized land. In Great Britain and America these churches are purely congregational in government. In Hungary a modified episcopacy prevails. As is to be expected from the content of the Unitarian habit of mind, its energies have been expended not in the upbuilding of a denomination or of ecclesiastical institutions, but in philanthropy, literature, and public-spirited service. In England we find in connection with this movement during the last century many eminent scientists, scholars, and leaders among women. In America, while the Unitarian churches have never contained more than one two-hundredth part of the population, yet the members of these churches have been conspicuous out of all proportion to their number in public life.

The chief working organizations of the Unitarians are the American Unitarian Association, Boston, Mass.; the British and Foreign Unitarian Association, London; the Consistory of the Hungarian Churches, Klausenburg, Hungary; the Japan Unitarian Association, Tokio, Japan; the Icelandic Unitarian Association, Winnipeg, Manitoba, etc. In general alliance with these bodies are the *Protestantenverein* of Germany, the *Protestantenbond* of Holland, the *Brahmo-somaj* of India, and organizations of the liberal Protestants in France, Switzerland, and Scandinavia.

The chief training schools for the Unitarian ministry in Europe are the Unitarian College in Klausenburg, Hungary; the Manchester College, Oxford, England; the Unitarian Home Missionary College, Manchester, England; and the Presbyterian College, Carmarthen, Wales. In America the Unitarian ministry is chiefly supplied from two undenominational divinity schools, which were founded by Unitarians and are maintained largely by Unitarians, but which require no dogmatic tests and which welcome alike in faculty and student body members of all denominations. These two schools are: (1) The Harvard Divinity School, situated at Cambridge, Mass., in connection with Harvard University (q.v.), and (2) the Meadville Theological School, founded in Meadville, Pa., in 1844, which like the Harvard Divinity School, enjoys an ample endowment. The charter of the Meadville School provides that "no doctrine or text shall ever be made a condition of depriving any of the opportunities of instruction in this school."

BIBLIOGRAPHY. The more important periodicals of the Unitarians are *The Christian Register* (Boston); *The Christian Life* and *The Inquirer* (London); *Unitarius Kozlony* (Klausenburg, Hungary). For the history of the Unitarian movement, consult: J. H. Allen, *Our Liberal Movement in Theology* (Boston, 1882), and his *Historical Sketch of the Unitarian Movement* (New York, 1894); E. H. Hall, *Orthodoxy and Heresy* (Boston, 1883); Bonet-Maury, *Early Sources of Unitarian Christianity in England* (London, 1884); Crooker, *The Unitarian Church* (Boston, 1902); Cooke, *Unitarianism in America* (ib., 1902). For the doctrines, consult: F. H. Hedge, *Reason in Religion* (ib., 1875); J. F. Clarke, *Essentials and Non-essentials in Religion* (ib., 1878); J. Martineau, *Seat of Authority in Religion* (London, 1890); B. Herford, *Forward Movement Lectures* (ib., 1895), together with the publications of the American Unitarian Association and the British and Foreign Unitarian Association. For further references, see the works of W. E. Channing, Theodore Parker, J. F. Clarke, M. J. Savage, and the biographies of W. E. Channing, Theodore Parker, R. W. Emerson, E. S. Gannett, and Dorothea L. Dix.

UNITED AMERICAN MECHANICS, JUNIOR ORDER OF. An order established in 1853 as a feeder to the Order of United American Mechanics (q.v.), providing for the admission of youths under the age of eighteen and their training for membership in the older organization. In 1885 the original purpose of the order was abandoned and it became an independent beneficiary organization. The total membership is about 112,000; total benefits disbursed from date of organization to 1903, $4,288,920.

UNITED AMERICAN MECHANICS, ORDER OF. A patriotic, fraternal, and benevolent organization founded in Philadelphia in 1845 with the object of safeguarding the interests of the American mechanic against the dangerous competition of foreign-born immigrants. Members must be eighteen years of age, born on American soil or where the flag flies, advocates of the public school, and opposed to the union of Church and State. No colored people are admitted. The order has no affiliations with trade unions, and does not interfere in labor disputes. It has a funeral benefit department and an insurance department. The Loyal Legion of United American Mechanics is the uniformed division of the order, established by the national council in 1846. There is also a woman's auxiliary known as the Daughters of Liberty, established in 1875. The membership of the order is about 430,000 and the benefits disbursed since the date of organization amount to $120,000,000.

UNITED BAPTISTS. See BAPTISTS.

UNITED BRETHREN, THE. See MORAVIANS.

UNITED BRETHREN IN CHRIST, THE. A religious denomination which arose among the Germans of Pennsylvania, under the preaching of Philip William Otterbein (q.v.), an ordained pastor of the German Reformed Church, and Martin Boehm, a preacher among the Mennonites. As their converts increased, laymen were licensed to preach. Their first formal conference met in Baltimore (1789), and their first annual conferenc at Frederick, Md., in 1800. Here the name by which they have since been known was adopted, and Otterbein and Boehm were elected first bishops. The first General Conference met in 1815, when a Confession of Faith and a Discipline were adopted.

The organization of the United Brethren in Christ includes quarterly and annual conferences, and a quadrennial General Conference, which is the only legislative body, and since 1901 has been composed of an equal number of ministers and laymen. The superintendency of the Church is vested in the bishops, who, with the general Church officers, are elected every four years by the General Conference. Since 1889 women have been eligible to the ministry. All ordained preachers are elders, the only order recognized. Members are forbidden the use of intoxicating liquors, and must not traffic in them. Slavery was prohibited after 1821. The theology of the United Brethren in Christ is Arminian. They accept two sacraments, baptism and the Lord's Supper. The mode of baptism is left to the choice of the candidate. Infant baptism is practiced. The spiritually dynamic presence of Christ in the Lord's Supper is acknowledged. The practice of foot-washing is discretionary. The government of the Church is democratic. The itinerant system is enjoined, but pastorates are not limited as to time.

A commission appointed by the General Conference of 1885 prepared, without doctrinal change, a restatement of the Confession of Faith and a revision of the Constitution, which, having been approved by the members, was adopted and proclaimed by the General Conference of 1889. It provided for lay delegates to the General Conference and set aside a rule prohibiting membership in secret societies. At this time Bishop Milton Wright and 14 of the 125 delegates composing the Conference withdrew and formed a branch of the Church, which adheres to the Confession of Faith and the Constitution as they were before the revision.

The larger division of the Church, which accepted the new Constitution, had in 1902 47 annual conferences and mission districts, including those in Germany, Japan, Ontario, and West Africa, four bishops, 1967 itinerant ministers, 434 local preachers, 249,314 members, 263,041 pupils in the Sunday-schools, 3358 church houses, and 827 parsonages, and it contributed for all purposes $1,661,524. It has a theological seminary at Dayton, Ohio, eight colleges, and four academies. It has a publishing house at Dayton, and issues from its presses 16 different publications aggregating 10,000,000 copies annually. There is a Board of Education; a Home, Frontier, and Foreign Missionary Society sustaining missions in Africa, Japan, Germany, Porto Rico, Ontario, and the United States; a Woman's Missionary Association, conducting missions in Africa, China, and the Philippines; a Church Erection Society; a Young People's Christian Union, with 63,846 members; and an Historical Society.

The branch which retains the old Constitution had in 1902 32 annual conferences, 4 bishops, 766 societies, 281 active itinerant and 133 local preachers, 25,670 members, 28,293 pupils in the Sunday-schools, 523 church houses, 88 parsonages, and aggregate contributions amounting to $144,624. There is a Home, Frontier, and Foreign Missionary Society, sustaining missions in 16 conferences and mission districts, including West Africa, and a Woman's Missionary Association, a Board of Education, a publishing house in Huntington, Ind., and colleges at Huntington, Ind., Albion, Wash., and in Oregon.

The Religious Telescope (weekly), *The Watchword* (weekly), *The United Brethren Review* (bi-monthly), and *The Year Book of the United Brethren in Christ*, besides missionary and Sunday-school publications, are issued by the New Constitution branch at Dayton, Ohio. The Old Constitution Church issues *The Christian Conservator* (weekly), *The Missionary Monthly*, and a *Year Book* at Huntington, Ind. For the history of the Church, consult Berger, *History of the Church of the United Brethren in Christ* (Dayton, 1897); consult also biographies of Bishops Otterbein (ib., 1884) and J. J. Glossbrenner (ib., 1889), by A. W. Drury; Jonathan Weaver (ib., 1901), by H. A. Thompson; and James W. Hott (ib., 1902), by M. R. Drury.

UNITED EVANGELICAL CHURCH, The. A religious organization formed in 1894 as the result of a division which had occurred in the Evangelical Association (q.v.). A meeting attended by delegates from six annual conferences was held at Naperville, Ill., in November of that year, and constituted the first General Conference of the United Evangelical Church. The legislation necessary to perfect the organization of an independent Church was enacted; a Book of Discipline was adopted, based upon the old Discipline of the Evangelical Association, with certain changes, such as the introduction of lay representation into the conferences.

In 1902 the United Evangelical Church had 10 conferences (including seven mission conferences), 979 organized congregations, 820 church buildings, 2 bishops, 501 itinerant and 214 local preachers, 63,390 church members, and 83,381 pupils in Sunday-schools. Besides assisting the seven mission conferences, the General Missionary Society has a mission in Changsha, Honan, China; and the Woman's Missionary Society coöperates with it. A Church Extension Society was established in 1902. The educational institutions are Albright College, Meyerstown, Pa.; Dallas College and La Creole Academy, Dallas, Oregon; Western Union College, Le Mars, Iowa. There is a publishing house at Harrisburg, Pa. Besides Sunday-school and similar publications the Church periodicals are *The Evangelical* (weekly), *Die evangelische Zeitschrift* (weekly), and *The Missionary Tidings*, all issued at Harrisburg. Consult Stapleton, *Annals of the Evangelical Association of North America and History of the United Evangelical Church* (Harrisburg, 1900).

UNITED EVANGELICAL CHURCH, The (IN GERMANY). A Church established in Germany in 1817 by the union of portions of the Lutheran and Reformed churches. Such a union had been attempted without success in 1529, 1631, 1661, and by Frederick I. of Prussia (1703-22). Frederick William I. published several decrees having the same object in view. It was favored also toward the end of the eighteenth century by the progress of theological thought. Schleiermacher proposed to establish an outward Church unity, leaving disputed points in scientific theology still open for discussion. At the tercentenary of the Reformation in 1817 a visible union was established, limited, however, at first, as many of its advocates supposed, to a common Church government, and a common celebration of the Lord's Supper. In this movement the Government of Prussia has always been the leader, and the United Evangelical Church is the State Church there, although dissensions have arisen at various times. A similar union of Lutherans with the Reformed Church has been accomplished in several other of the German States; while of the rest some are too exclusively Lutheran, and some too exclusively Reformed to warrant the attempt. In the United States a branch of the United Evangelical Church was established near Saint Louis in 1840. See GERMAN EVANGELICAL SYNOD OF NORTH AMERICA; see also GERMAN EVANGELICAL PROTESTANT CHURCH.

UNITED FREE CHURCH OF SCOTLAND. See PRESBYTERIANISM.

UNITED IRISH LEAGUE OF AMERICA. An association of Irish-Americans which is practically the successor of the Parnell Land League and of the Irish Federated Societies in sympathy with the Land League Movement. It was provisionally established in New York, December 4, 1901, and was ratified at the first National Convention of the United Irish League held at Boston, October 20-21, 1902. The purpose of the league is to act as an auxiliary in America to the national organization in Ireland in the achievement of its aims. These include self-government for Ireland, the abolition of landlordism there, and other reforms of political and economic conditions in the country. Membership in the league is open to all Irish-American Nationalists without distinction of class or creed, and to all sympathizers with the national claims of Ireland. The general management of the league when not in convention is vested in a national committee, consisting of the president, two vice-presidents, treasurer and secretary, and

31 members at large. The National Convention is held biennially or oftener at the discretion of the national committee.

UNITED IRISHMEN, Society of. An Irish revolutionary society founded in 1791. It was an outgrowth of the sentiments inspired in Ireland by the French Revolution, which found earliest acceptance among the Presbyterians of Ulster, especially Belfast. Its object was to obtain complete political emancipation of both Catholics and Dissenters, and to reform the Irish Parliament. It soon spread among the Catholics of the south, and even members of the Established Church joined the movement. The Government in 1783 passed the Relief Act in the Irish Parliament. This gave the suffrage to Catholics, but did not qualify them for office. An attempted measure of Parliamentary reform was, however, rejected in 1794, and the recall of Lord Fitzwilliam removed the hopes of the society for reform through Parliamentary means. The society then became more revolutionary, collected arms and became to all intents and purposes a military organization. It promised the confiscation of the land of hostile landlords to the peasants and sent emissaries to France for aid. Its numerical strength was greatly increased in the south by the action of the Orangemen of Ulster (Peep o' Day Boys) in expelling the Catholic inhabitants, who were forced to find refuge in the south. In 1796 Wolf Tone, the chief agent in the organization of the society, was sent to France to procure military aid, and an expedition of 15,000 troops under the command of Hoche (q.v.) was fitted out. A violent tempest, however, prevented the French from landing and the expedition accomplished nothing. The society, nevertheless, remained ready for an invasion. Two directories were established, one in Belfast, and the other in Dublin. They were reputed to have 200,000 recruits, but the number was certainly an exaggeration. Meanwhile the Government resolved to repress the movement before an invasion by France could be attempted, and under the pretext of repressing disorder the leaders of the movement in Ulster were arrested, and the Protestant militia and yeomanry let loose on the population of the south. This irregular force committed the greatest brutalities, it being evidently the intention of the Government to incite the peasantry to open rebellion before the preparations for a revolution could be completed. The rebellion broke out on May 3, 1798, and was confined to parts of Leinster. As it necessarily assumed the aspect of a religious war, the Presbyterians of Ulster took no part in it. The rebellion was suppressed before the arrival of the French, and shortly afterwards Wolfe Tone himself was captured. The Constitution and Oath of the Society are printed in Plowden, *History of Ireland,* vol. iii. (Philadelphia, 1806). Consult also *The Proceedings of the Dublin Society* (Philadelphia, 1795). The most complete work on the subject is Madden, *The United Irishmen* (Dublin, 1858). For a brief account consult Hassencamp, *History of Ireland* (London, 1888).

UNITED METHODIST FREE CHURCHES. See Methodism.

UNITED PRESBYTERIANS. See Presbyterianism.

UNITED PROVINCES. See Netherlands.

UNITED PROVINCES OF AGRA AND OUDH, formerly Northwestern Provinces and Oudh. A province of British India, occupying the Upper Ganges Valley. It is bounded by Tibet, Nepal, Bengal, the native States of Central India, Rajputana, and the Punjab (Map: India, C 3). Total area, 112,243 square miles, of which 83,198 belong to the Territory of Agra, 23,966 to Oudh, and 5079 to the native States of Garhwal and Rampur. Except the extreme northern part, which is a wild and elevated mountain region of the Himalayas, the province is a low alluvial plain watered by the Ganges and its numerous large parallel tributaries, chief of which is the Jumna. The climate is hot and unhealthful, especially in the large, marshy jungle region along the base of the mountains. The soil is fertile, but the western and southern parts of the province have a very uncertain rainfall, and are subject to severe droughts, so that these regions would be practically a desert were it not for their numerous large streams.

Extensive irrigation works have been constructed. The area irrigated in 1900 was estimated at 8,234,000 acres, or about one-third of the total cropped area. About two-thirds of this area was irrigated from wells and the remainder principally from reservoirs (tanks) and Government canals. The different crops produced are of more nearly equal importance than in any other province. The region ranks next to the Punjab as a wheat producer, and though rice is of much less relative importance than it is in Bengal and some of the other provinces, it covers almost as great an extent as does wheat, or about 4,500,000 acres. There are large acreages of millet, pulse, and other food grains. More sugar-cane is grown (1,000,000 acres) than in any other governmental district, and opium, cotton-oil seeds, and indigo receive considerable attention. The people eat little animal food, and stock-raising is of subsidiary importance. Cattle and buffaloes take the place of horses.

Modern methods of manufacturing have been little adopted. There are six cotton mills, employing about 7500 hands. Four of these mills are located at Cawnpore. The Ganges affords a means of water transportation. The province is better supplied with railroads than any other in India. It exports large quantities of oil seeds, wheat, raw cotton, hides, sugar, indigo, and opium, and imports cotton goods, metals, railroad materials, coal, and salt. A frontier trade is carried on with Tibet and Nepal.

The United Provinces are under the administrative control of a Lieutenant-Governor appointed by the Governor-General of India. There is a legislative council of 15 members, of whom 7 may be officials. There are 104 municipalities, in 98 of which the taxpayers elect a majority of the members of the municipal boards. There are also 44 district boards, over four-fifths of the aggregate number of board members being elected. There was a police force, in 1898, aggregating 24,888 officers and men. For the year ending March 31, 1901, the revenue collected amounted to $42,325,309, and the expenditure was $20,437,436. Allahabad is the capital.

In 1901 the population of the United Provinces without Oudh (q.v.) numbered 34,812,000, or 417 to the square mile. The eastern part is the most densely populated. A comparison with earlier census returns shows that the population is almost stationary. The people are mainly Hindus. Those who hold to some form of the Hindu religion outnumber the Mohammedans about 7 to 1. The Christians number about 100,000. There are more large cities in the United Provinces than in any of the other provinces. The chief are Lucknow (in Oudh), Benares, Cawnpore, Agra, Allahabad, Bareilly, and Meerut.

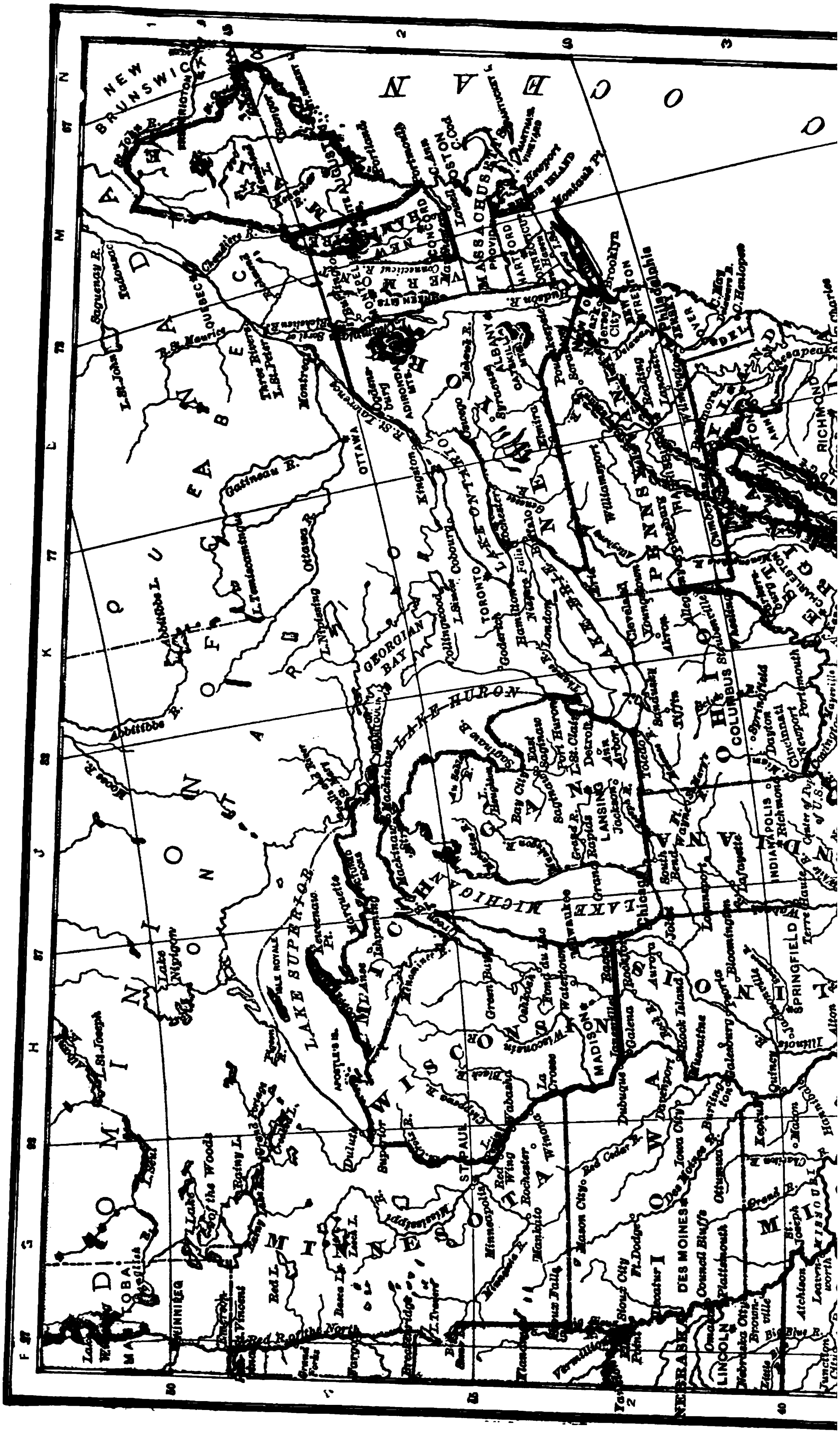
UNITED STATES. The territory of the United States of America, exclusive of Alaska and colonial dependencies, lies in the temperate portion of North America, but reaches almost to the tropical zone. It embraces an area of 2,970,038 square miles. The area including Alaska is 3,560,922 square miles; and including the colonial dependencies, 3,699,440 square miles. The United States proper, or the United States south of Canada, extends approximately from longitude 67° to 125° W. from the Atlantic Ocean (whose great arm, the Gulf of Mexico, forms half of the southern boundary) to the Pacific. The northern boundary is somewhat arbitrary in the east between New England and the Lower Saint Lawrence region, but from northern New York it follows the Saint Lawrence and the middle line of the Great Lakes to northern Minnesota. Beyond the Lake of the Woods the boundary follows the 49th parallel to the Pacific Ocean. The peninsula of Florida extends to about 25°, and the southern part of Texas to about 26°, north latitude. The parallel 49° is about that of Paris, while the latitude of Key West carries one far down into the Sahara. It may be further observed that New York is on the parallel of Naples and Constantinople, and Memphis on that of Gibraltar. The United States has preponderatingly a natural boundary of salt and fresh waters. On the side of Mexico and of British Columbia the boundary crosses the Cordilleran Ranges. This article treats of the United States proper except when otherwise stated. Alaska, and also the colonial dependencies (see section *Colonies* below), are treated under their respective heads.

General Description. The lands of the United States may be roughly separated into four areas: the Atlantic lowlands, the Appalachian highlands, the Mississippi Valley, and the Pacific highlands. These regions are nowhere sharply separated from each other. Leaving out for a moment the narrow strip of Atlantic lowland, one may best view the United States as made up of two great uplands, with a broad lowland lying between. The country thus shows the physical plan of North America, for the Appalachian belt rises from the Gulf plains in Alabama and ends northward on the shores of Labrador. The Western uplands or Cordilleras begin virtually at the base of the continent; they rise to a great elevation in Mexico, maintain great heights and gain their greatest width in the Western United States; and thence continue through British America and Alaska. In like manner the Mississippi plains are continuous with the Hudson Bay region and the central plains of Canada to the shores of the Arctic Sea, and it is possible to pass from the delta of the Mississippi to the mouth of the Mackenzie River without rising 1000 feet above the ocean.

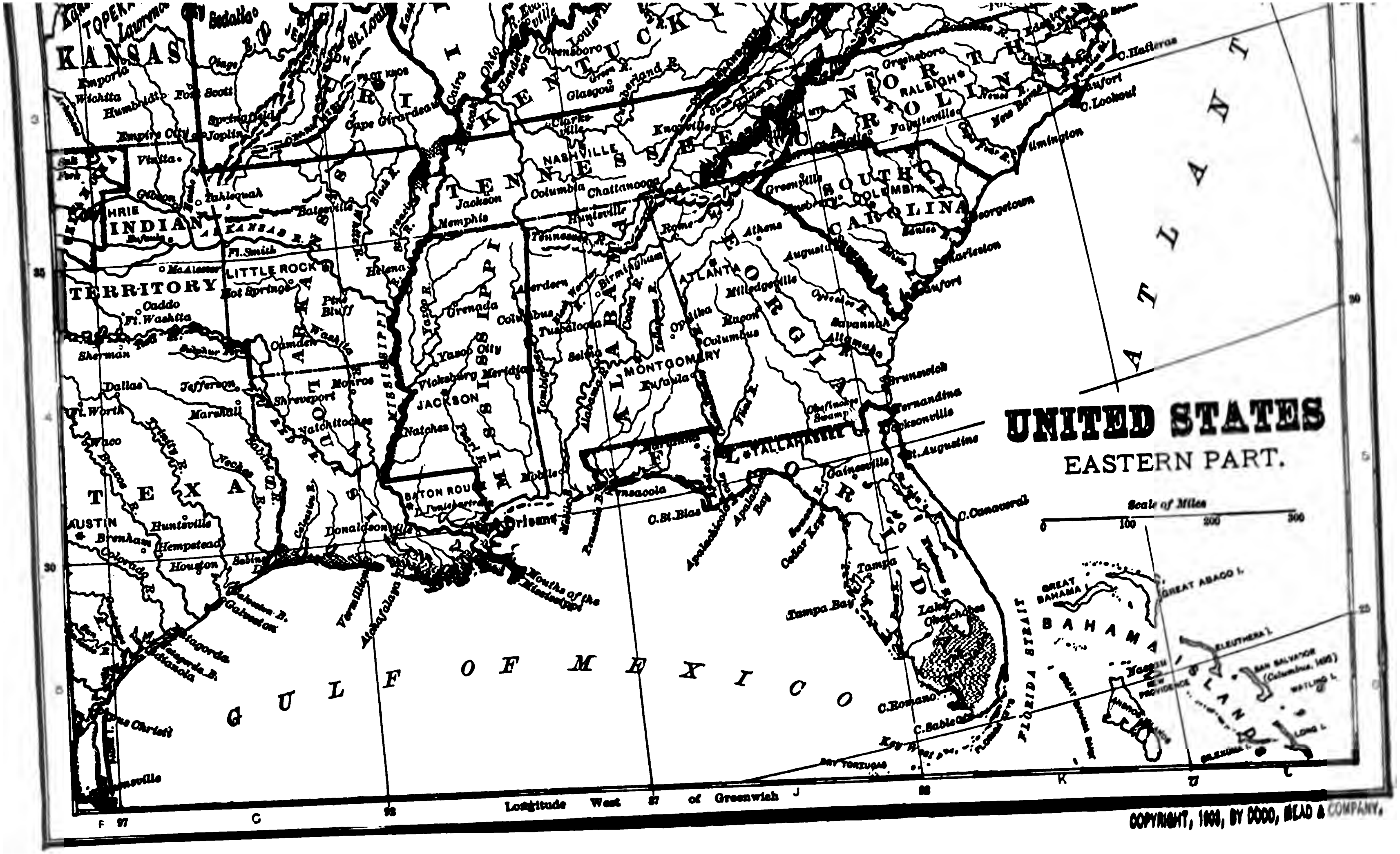
The Atlantic Lowland. This region, although not large, contains a vast population, and is historically the most important. It made the interior of the continent accessible to discovery from the east, offered hospitable ground to the colonists, and is rich in the harbors that have led to the building of cities and the growth of commerce. These lowlands are not the same in origin in the North as in the South. The Atlantic rim of New England is a rough lowland rising from sea level to the height of four or five hundred feet. It is beset with rough hills, of native rock, and of glacial waste. It is an uneven but subdued or nearly worn-out mountain country, like western Massachusetts or northern New England, except that it is more fully degraded. South of New York, on the other hand, and reaching to Florida Strait, is the Atlantic Coastal Plain, including southern New Jersey, Delaware, and a broad belt of all the South Atlantic States. It is a smoother land, without projecting masses of rocky hills, and sloping gently up from the tide levels to the rougher lands of the Appalachian belt. It is intersected by Delaware and Chesapeake bays and their rivers, and by more southerly streams. It is often known as the 'tidewater country' because the sea enters its estuarine rivers for scores of miles. It is covered with fields of tobacco, cotton, rice, and fruit orchards, or with pastures or native forest. The region is in greater part a sea bottom uncovered at a comparatively recent period, and becomes continuous, beneath the Atlantic waters, with the continental shelf which lies between the land border and the deep seas. West of this plain is a much denuded belt of ancient Appalachian mountains, which is becoming known as the Piedmont Plain. It is from a few hundred to a thousand feet in altitude and lies between the coastal plain and the Blue Ridge. See Piedmont Plain.

One feature of the entire Atlantic coast is that the rivers are tidal. They may occupy narrow channels to the sea border, like the Hudson, or they may enter at the head of deep and spacious bays, as do the Delaware and the Susquehanna. Such a water system with the above rivers, the Potomac, James, and other streams, is well called a 'drowned' river system. By this is meant that the trunk valley and its branches were cut out by land streams, and that the sea has entered their lower parts because of a sinking of the edge or of larger parts of the continent. The historical meaning of these conditions can hardly be reckoned. It is enough here to observe that nearly all the harborages and quiet salt waters of our Atlantic border have this origin; and that thus have grown our great seaboard cities, where ships may ride safely at the mouth of tidal streams whose waters offer gateways to the interior of the continent.

The Appalachian Uplands. From the physical point of view these may be taken as the eastern part of the rocky skeleton of the country and the continent. In their highest points, the White Mountains in the north and the Black Mountains in the middle south, they attain elevations exceeding 6000 feet in the loftiest projections east of the Rocky Mountains. Historically they form the Appalachian barrier, with large consequences in colonial annals and in the opening of the lands that lie westward. See Appalachians.



DOMINION OF CANADA
ONTARIO
QUEBEC
NEW BRUNSWICK
MAINE
NEW HAMPSHIRE
VERMONT
MASSACHUSETTS
NEW YORK
PENNSYLVANIA
NEW JERSEY
OHIO
MICHIGAN
INDIANA
ILLINOIS
WISCONSIN
MINNESOTA
IOWA
MISSOURI
NEBRASKA
MANITOBA
OCEAN
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
GEORGIAN BAY
Lake of the Woods
Lake Nipigon
OTTAWA
TORONTO
ALBANY
COLUMBUS
LANSING
MADISON
INDIANAPOLIS
SPRINGFIELD
DES MOINES
ST. PAUL
LINCOLN
RICHMOND
Chicago
Detroit
Philadelphia
Boston
Montreal



UNITED STATES
EASTERN PART.

COPYRIGHT, 1898, BY DODD, MEAD & COMPANY.

The Central Lowlands. We give this name to the lower lands of the Mississippi basin, although it is but a vague designation. These plains pass gradually up into the plateau on the east. To the north they merge with the smooth lowlands about the Great Lakes, to the south they are continuous with the Gulf lands, and to the west they pass gradually into the high plains west and south of the Missouri River. The region is often called, in the same rough way, the Prairies. See **Prairie.**

The Great Lake Region. The lands about the Great Lakes have considerable variety. During the recession of the continental glacier the lakes had higher water levels and often much greater extent than now. During this flooded condition what are now the bordering lands received a cover of such fine muds as are spread upon the bottom of all great bodies of water. To some extent previous inequalities are masked, and the resulting surface is often very smooth and almost level. This is especially true of lakes Ontario, Erie, Huron and Michigan. Some of these lands were treeless and hence were properly called prairies, although modern physiography prefers to designate them as lake plains. Lake Superior is surrounded by older rocks, which have been greatly disturbed and metamorphosed, and the remnants of these ancient mountains form a higher and rougher land than about the lower lakes. This is true of the northern peninsula of Michigan, of Wisconsin, and of northeastern Minnesota. Naturally, therefore, these rocks hold vast stores of iron and copper, while the strata of the prairies offer little in the way of mineral resources except coal. See **Great Lakes.**

The Gulf Plains. These are most simply defined as a continuation of the Atlantic Coastal Plain, or another part of the younger fringe of the continent. In central Georgia and Alabama the younger formations abut on the older rocks of the southern Appalachians and mark approximately the encroachment of the later seas. By gentle uplift the marginal sea bottoms of the Gulf were laid bare, and form the flat lowlands of this semi-tropical region. This explains in brief the origin of the peninsula of Florida, most of whose surface has now an altitude of less than 100 feet. A gentle uplift of the sea bottom brought this land into existence. Cavernous openings in the rocks, underground streams, and springs of great volume result from the presence of extensive limestone formations as part of the bed rock of the region. The seaward edge of this land abounds in sand bars, coral reefs, and mangrove swamps, and this single State, counting its main shores, its bays and numberless islands, has more than 4000 miles of shore line. It is proposed to open a way for quiet water navigation down the entire east coast of Florida.

Westward from Alabama, the Mississippi River (q.v.) becomes the controlling feature in the topography of the Gulf region. The broad Gulf plain occupies a large part of southern and eastern Texas. As in the region to the eastward, the younger rocks have been made into land by uplift and retreat of the sea. As a rule the surface slopes gently toward the Gulf, but with escarpments and great local variations of topography. Some areas are prairie, while others are heavily forested, and the rise to the northwest leads first to the great plateau, or Llano Estacado, and then to the mountains of the Rocky Mountain Range. The shore line is a long crescent, bordered by extensive sand bars, which inclose stretches of quiet water. Galveston is on one of these bars, and it is thus exposed to the Gulf hurricanes.

The Great Plains. This is the name usually given to the lands which rise gradually from the prairies to the eastern base of the Rocky Mountains. But the altitude of these lands is such that they might be called with propriety a plateau. From altitudes of about 1000 feet along the Missouri River in Kansas and Nebraska, they rise to heights of 5000 to 6000 feet at the foot of the western mountains. In general this rise is imperceptibly gradual, but its continuity is sometimes interrupted by escarpments, and the easterly flowing rivers have incised shallow valleys upon the region. The strata are little disturbed and thus the country resembles the prairie region, but the underlying beds are geologically younger and are overlain in many areas by large bodies of waste, which in part may have been deposited in lakes and in parts was no doubt distributed by torrents from the mountains. Climatic causes have also made the region different in aspect from the prairies. The plains are semi-arid in the east and truly arid in the west, and are therefore but sparsely clad with vegetation. Forests are thus infrequent, the herbaceous vegetation is sparse and has the character of the desert, and agriculture as one goes west is dependent on irrigation. Over large areas the water supply for this purpose is deficient, and grazing is the only remaining resource. This region is a vast one, having the east and west limits already given, and reaching from central Texas to the northern border of the country, where it merges into the great Western plains of Canada. In the north the most prominent break in the plains is the Black Hills mountain area. Here an elevated mass of ancient rocks protrudes through the younger strata, giving a region of rugged relief, hard rocks, mines, and forests. In the Black Hills region, in much of the western Dakotas, and in Montana and western Nebraska, are the Bad Lands (q.v.).

Uplands of Missouri and Arkansas. There is yet to be noticed the most extensive body of elevated land between the Appalachians and the higher levels of the great plains. This lies in southern Missouri and in northern and central Arkansas and westward. In Missouri these uplands are of moderate height, dissected by the rivers, covered with forests, and known as the Ozark Plateau. Still better known, owing to their metallic deposits, are some low mountains of very ancient rocks familiar as Iron Mountain and Pilot Knob. Running through central Arkansas are the Ouachita Mountains. These rise from below the young sediments of the Mississippi Valley, and trend westward, passing through Indian Territory and Oklahoma into northern Texas. This upland region south of the Missouri River, therefore, is associated on various sides with the prairies, the alluvial plains of the Mississippi, the Gulf plains of the South, and the great plains of the West.

The Rocky Mountains. The name is properly applied only to an eastern range of the Cordilleran or Western Uplands. The range, with numerous peaks rising above 14,000 feet, extends through Idaho, Montana, Wyoming, Colorado, and New Mexico, and sends some outlying ridges into Texas. See Rocky Mountains.

The Colorado Plateaus. West of the Rocky Mountains, in Wyoming, Colorado, Utah, New Mexico, and Arizona, is the basin of the Colorado River. This great stream confines its drainage, save near its mouth, to an upland several thousand feet above the sea. Having abundant sources in the rains and snows of the various parts of the Rocky Mountain Range, and rising at great altitudes, it has both velocity and volume, and hence has cut out the great cañons for which it is famous. This is a deeply but only partly dissected region consisting of blocks of strata, cut apart from each other by profound gorges, often intricate in pattern. Being an arid region, the abundant waters are of remote derivation and sunk in the cañons, while the sparse rainfall causes desert conditions to be general, with much exposed rock, little vegetation, and a general absence of conditions favorable to civilized life. Closely associated with these great plateaus are two short but lofty ranges of mountains. One of these is the Wasatch, marking the boundary between the plateaus and the Great Basin, in central Utah. The other is the Uinta Range, about 150 miles in length, and extending from northwestern Colorado through the borderlands of Wyoming and Utah. Its chief development is in the latter State and in its east and west trend it departs from the usual direction of American mountain axes.

The Great Basin. This is an area of interior drainage, made up of many minor basins, of which the chief is that of the Great Salt Lake in Utah. See Great Basin.

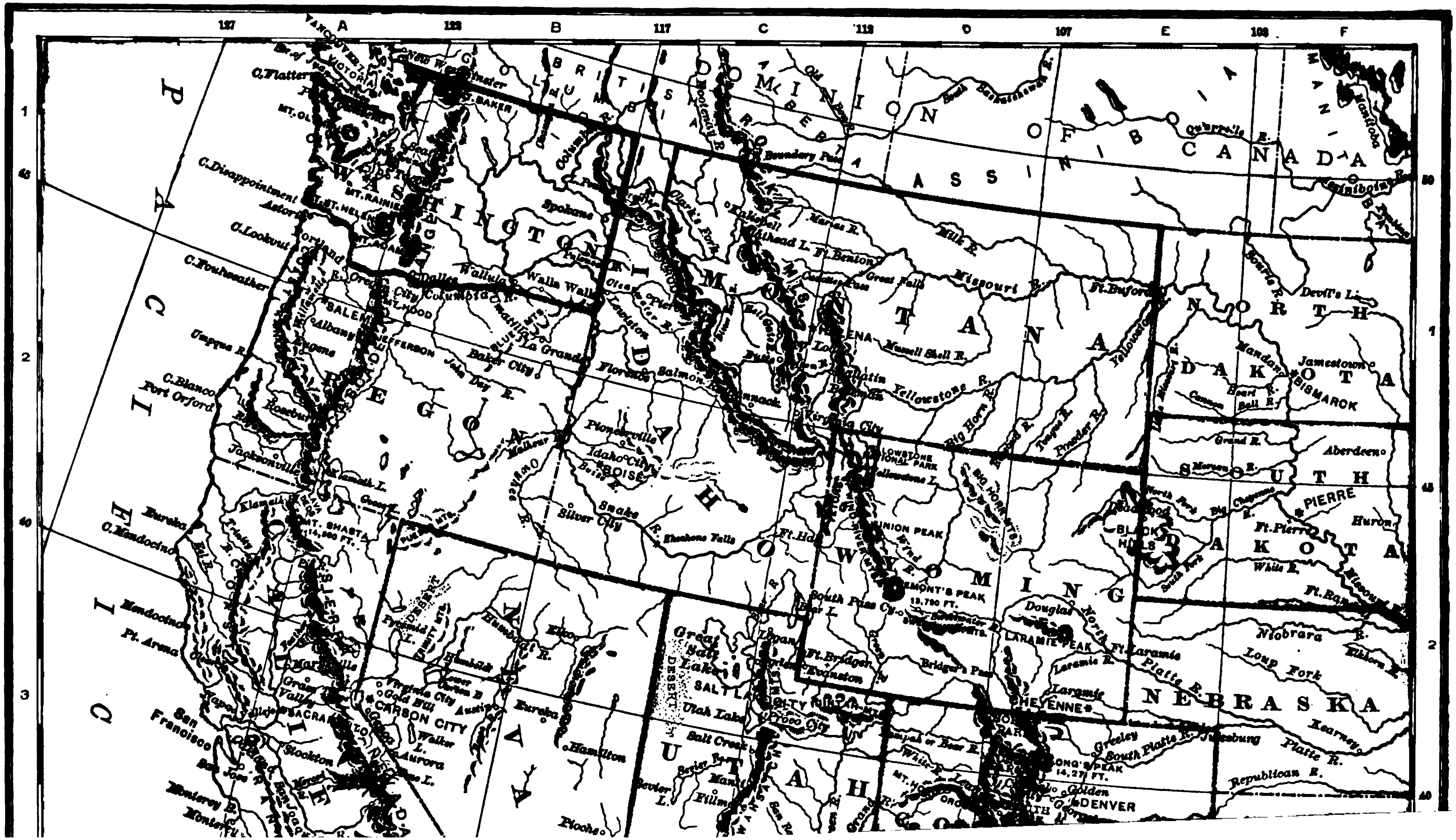
The Columbia and Snake River Plateaus. Large areas drained by these streams in Idaho, Oregon, and Washington are of volcanic origin, and along the Snake River in Idaho and Oregon the lavas form plateaus about 4000 feet in altitude. They are a natural desert, since the region is arid, but are capable of great development under the process of irrigation.

The Mountains and Valleys of the Pacific Coast. The features to which reference is here made belong to three States, California, Oregon, and Washington. They will be best understood if it is observed that a single lofty range, the Sierra Nevada, forms the eastern border of California, and that it extends, under the name of the Cascade Range, northward through central Oregon and Washington. Its culminating point, in California, is seemingly Mount Whitney (14,500-15,000 feet), which may also be the culminating point of the entire United States south of Alaska. Bordering the sea are lower and younger mountains, constituting also a prolonged range, but variously named, as the Coast Range in California, the Klamath Mountains in Oregon, and the Olympic Mountains in Washington. (See Sierra Nevada; Cascade Range, etc.) Between these parallel ranges are lowland valleys of the utmost importance in the development of the region. In California there is the great valley drained by the Sacramento and Joaquin rivers, the centre of the fruit and grain culture of the State. In Oregon the Willamette Valley is analogous in origin and in human importance to this, as still farther north there is the Puget Sound Valley in the State of Washington. In association with these mountain ranges, reference should be made to the giant and minor volcanic cones which line their trend, and many of whose well-formed summits rise high into the snowline (Shasta, Hood, Rainier, Baker). The coast line of the Pacific is not nearly so great as that of the Atlantic coast, because it is less indented. It has, however, a few of the choicest bodies of inland or protected waters to be found on any shore. Such are San Francisco Bay and Puget Sound, while the deep, tidal Columbia and Willamette rivers offer similar advantages to northern Oregon. It is thus seen that the Cordilleran system is made up of several parallel ranges of mountains, separated in turn by intermontane areas of lofty plateau, or, nearer Pacific Ocean, by broad and fertile lowlands.

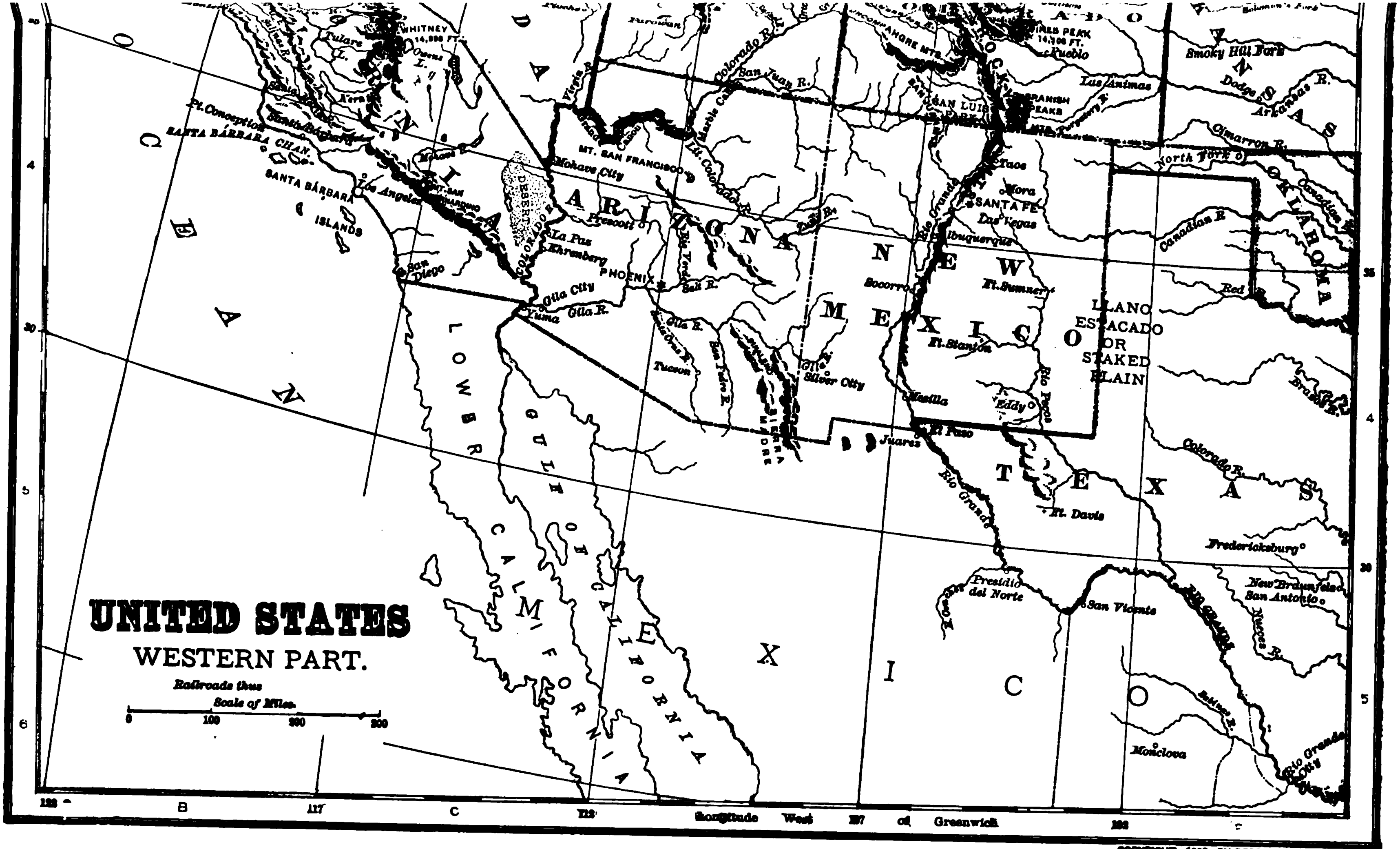
Hydrography. The drainage of the United States may be classed as Atlantic and Pacific. As with the entire continent, and with South America, the smaller ocean receives by far the greater contribution of fresh water from the lands now under review. The Atlantic streams may be considered as belonging to the Hudson Bay, the Gulf, or to open sea drainage. With unimportant exceptions farther west, the Red River of the North carries the contribution of the United States area to Hudson Bay waters. The open sea streams are all of moderate length and volume except the Saint Lawrence, which should be viewed as rising in Minnesota, although locally expanded into lakes of exceptional size. (For details concerning these bodies of water, the reader is referred to the article Great Lakes.) All the streams which enter the lakes from the United States are relatively small. Their courses are short, which is equal to saying that the line of water partings between the Laurentian and Mississippi basins is close to the lakes. The divide is also nearly everywhere quite inconspicuous. The streams have thus small capacity for transporting land waste into the lakes. Such waste as reaches the lakes rests in them, a condition from which results the exceeding clearness of Niagara, or of the Saint Lawrence waters that pass the Thousand Islands.

The open Atlantic streams, draining that part of the country which is historically oldest, and being often tidal, have a fame and a commercial value out of all proportion to their size. To begin with the rivers of New England, its conspicuous streams, the Penobscot, Kennebec, Merrimac, Connecticut, and Housatonic, are most of them entered by the tides for many miles. The Merrimac and Connecticut, above tide water, are types of many New England rivers which are interrupted by rapids due to glacial blockade, thus furnishing a great store of water power.

New York is composite in drainage. The Hudson, with the Mohawk, drains much of its central and eastern lands, but is chiefly important for its tidal course of 150 miles, with great harborage at its mouth, and an open gateway to the west from the head of tide water. The Genesee, Black, and other rivers carry to the Saint Lawrence much of the run-off of northern and western New York. The Susquehanna, the Delaware, and the Mississippi take nearly all the remainder of New York waters. In a most anomalous manner, due to glacial change of slope, the Allegheny gathers for the Gulf of Mexico waters that fall within a few miles of Lake Erie.



DOMINION OF CANADA
BRITISH COLUMBIA
ALBERTA
ASSINIBOIA
MANITOBA
WASHINGTON
OREGON
IDAHO
MONTANA
WYOMING
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
NEVADA
UTAH
CALIFORNIA
PACIFIC
VICTORIA
New Westminster
Spokane
Walla Walla
Portland
SALEM
Astoria
MT. RAINIER
MT. HOOD
Baker City
La Grande
Lewiston
BOISE
Idaho City
Silver City
Ft. Benton
Great Falls
HELENA
Virginia City
Ft. Buford
BISMARCK
Jamestown
Devil's L.
Aberdeen
PIERRE
Huron
BLACK HILLS
FREMONT'S PEAK 13,790 FT.
LARAMIE PEAK
CHEYENNE
Ft. Laramie
Ft. Bridger
Evanston
Great Salt Lake
SALT LAKE CITY
Utah Lake
Provo City
DENVER
LONG'S PEAK 14,271 FT.
Golden
Greeley
Julesburg
CARSON CITY
Virginia City
SACRAMENTO
Stockton
San Francisco
Eureka
C. Mendocino
MT. SHASTA 14,390 FT.
Jacksonville
Roseburg
Eugene
Albany
Port Orford
C. Blanco
C. Disappointment
C. Flattery
Missouri R.
Yellowstone R.
Snake R.
Salmon R.
Columbia R.
Platte R.
Humboldt R.
Hamilton
Eureka
Pioche
Austin
127
A
123
B
117
C
113
D
107
E
103
F
1
2
3
45
40
50



COPYRIGHT, 1908, BY DODD, MEAD & COMPANY.

The Delaware, Susquehanna, and Potomac are all important rivers which rise in the Catskill-Allegheny Plateau and find their way across the various mountain ridges of the Appalachian system by water gaps, and enter bays due to sinking of land and invasion of old valleys by the salt waters. In the plateau, where the strata are horizontal, the streams are dendritic, or finger-like, in arrangement. Within the mountain belt, the streams are in parts longitudinal, and in part transverse. By thus running between the ridges and cutting through them in water gaps, a rectangular or trellised drainage is formed which is widely found in the Appalachian region. The northern Appalachian waters thus flow mainly to the open Atlantic. In the south, however, or beyond the Potomac, the coastal rivers head in the eastern edge of the mountains, while the Kanawha and the Tennessee, with their branches, head far across the mountains and carry the waters to the Ohio River. The great core of the southern Appalachians, in western North Carolina, so convenient, it would seem, to the sea, is thus drained by a circuitous route into the Gulf of Mexico. The entire belt of Appalachian uplands has for the most part arrived at the stage of mature dissection, with abundant valleys, sunk from 500 to 1500 feet below the prevailing level of the uplands.

Many rivers of local importance rise on the eastern slope of the Blue Ridge, and cross the Piedmont Plateau and the Coastal Plain to the sea. Such are the James and other rivers of Virginia, the Roanoke, Cape Fear, Great Pedee, Savannah, and Altamaha of the Carolinas and Georgia. The rivers of Florida are mainly small, but have important tidal courses. The other Gulf drainage is overshadowed in magnitude by the Mississippi. The greater streams aside from this are the Chattahoochee, Alabama, and Tombigbee on the east, and the Colorado (of Texas) and Brazos on the west, and the international Rio Grande, rising in Colorado and New Mexico.

THE MISSISSIPPI RIVER. See MISSISSIPPI RIVER.

PACIFIC DRAINAGE. The Rocky Mountains in Colorado offer the most compact source of important drainage within the United States. To the south they send forth the Rio Grande. To the east flows the Arkansas, while to the north and east pass important branches of the Missouri. From the southwest issues the San Juan, while farther north the Grand, White, and Yampa rivers leave the State. All these join the Colorado River, and thus introduce us to the most southerly of rivers in the United States that reach the Pacific Ocean. Some of the chief facts concerning this river have been given in the description of the topography of the region. Its ultimate sources are in the Wind River Mountains of Wyoming. Thence it crosses the plateau of the southeastern part of that State and passes by a great gorge through the heart of the Uinta Mountain Range. It is here known as the Green River, but becomes the Colorado after receiving the Grand. Thence it threads its greater cañons and crosses the low desert region to the Gulf of California. Not far from its mouth it receives the Gila from the east. The only remaining master stream is the Columbia, with its widespread sources in the Rocky Mountains. These largely belong to its tributary, the Snake River, which after passing the lava plateaus joins the trunk stream in southern Washington. The Columbia has an important tidal course before it enters the ocean, and this and the Saint Lawrence are the only rivers of the United States which receive great accessions to their waters from foreign territory.

The foregoing review has shown how various are the rivers of the United States in their physical features. The Hudson may be taken as the type of that great number of streams, especially on the Atlantic side, which have a tidal course. Within the glaciated district most rivers show serious inequalities in their beds, causing innumerable rapids and waterfalls. Such concentration of descent does not occur elsewhere, save in the mountainous belts. The greatness and destructiveness of floods depends upon rainfall, gradient, the porosity of the rocks or soil, and other features. Thus the Ohio has steep slopes, an impervious bed, and a moist climate, when compared with the Missouri taken as a whole. In its long course across the plains the latter loses by seepage, by evaporation, and by abstraction of water for irrigation.

The rivers exhibit great diversity in relation to human uses. The Merrimac and many other streams within the glacial belt are mainly useful for manufacturing or for water supply. The Mississippi is chiefly of value as a highway, while the Hudson combines transportation, water and ice supply, and the furnishing of power. The Colorado is thus far almost purely scenic in its relation to man, arousing interest by the origin and magnificence of its cañons. A new era of utilization of these American river waters is now being entered upon. See IRRIGATION.

CLIMATE. The greater part of the area of the United States proper has a climate pertaining to the temperate zone. The average annual temperatures vary from somewhat less than 50° on the northern border to 75° in the extreme southeast. The average temperature for July is about 60° on the northern border and for January it is about 20°. The whole country is exposed to much greater annual oscillations of temperature than occur in Europe. The average of the absolute maximum temperatures is as high as 115° to 120° in the drier portions of Texas and Arizona, and the average minimum falls as low as —40° in northern Minnesota. The climate of the United States is controlled very largely by its characteristic winds. In January these are from the west, but in July southeast winds prevail in the Southern States, which penetrate up the eastern slope of the Rocky Mountain range, but finally turn eastward with the westerly winds of the northern portion of this region.

The storm centres that pass across the country originate almost equally on the Pacific Ocean and on the Atlantic. Those that approach from the Pacific move southeastwardly into Kansas and Nebraska and then turn eastward over the lake region; those that come from the Atlantic move westward among the West Indies and turn northward toward the Lower Lake Region; a certain number originate on the southeastern slope of the Rocky Mountains and move northeastward to the lake region. The lake region is, therefore, on the average the stormiest portion of the continent, and indeed of the whole Northern Hemisphere. The passage of every storm centre is accompanied by a shifting of the winds from warm southerly to cold northwesterly, and this, consequently, gives to the interior of the United States its extreme variability of climate, so that even the southern extremity of the country scarcely belongs to the tropical zone. The cold air that flows in behind the storm centres is very dry and the sky is quite clear. Thus originate the so-called anti-cyclones or cold waves which follow each other rapidly, moving southeastwardly toward the Gulf of Mexico, while the areas of low pressure or cyclones move northeast over and beyond the lake region. The absolute annual range of temperature is therefore greatest in the interior of the country, being about 150° in the upper portion of the Missouri Valley and diminishing to 60° in the southern part of Florida and the northwestern part of Oregon. The suddenness with which the air temperature falls is an important consideration from many points of view. Thus changes of 20° in twenty-four hours occur far more frequently in the lake region than in the Ohio Valley, and there again oftener than on the southern coasts.

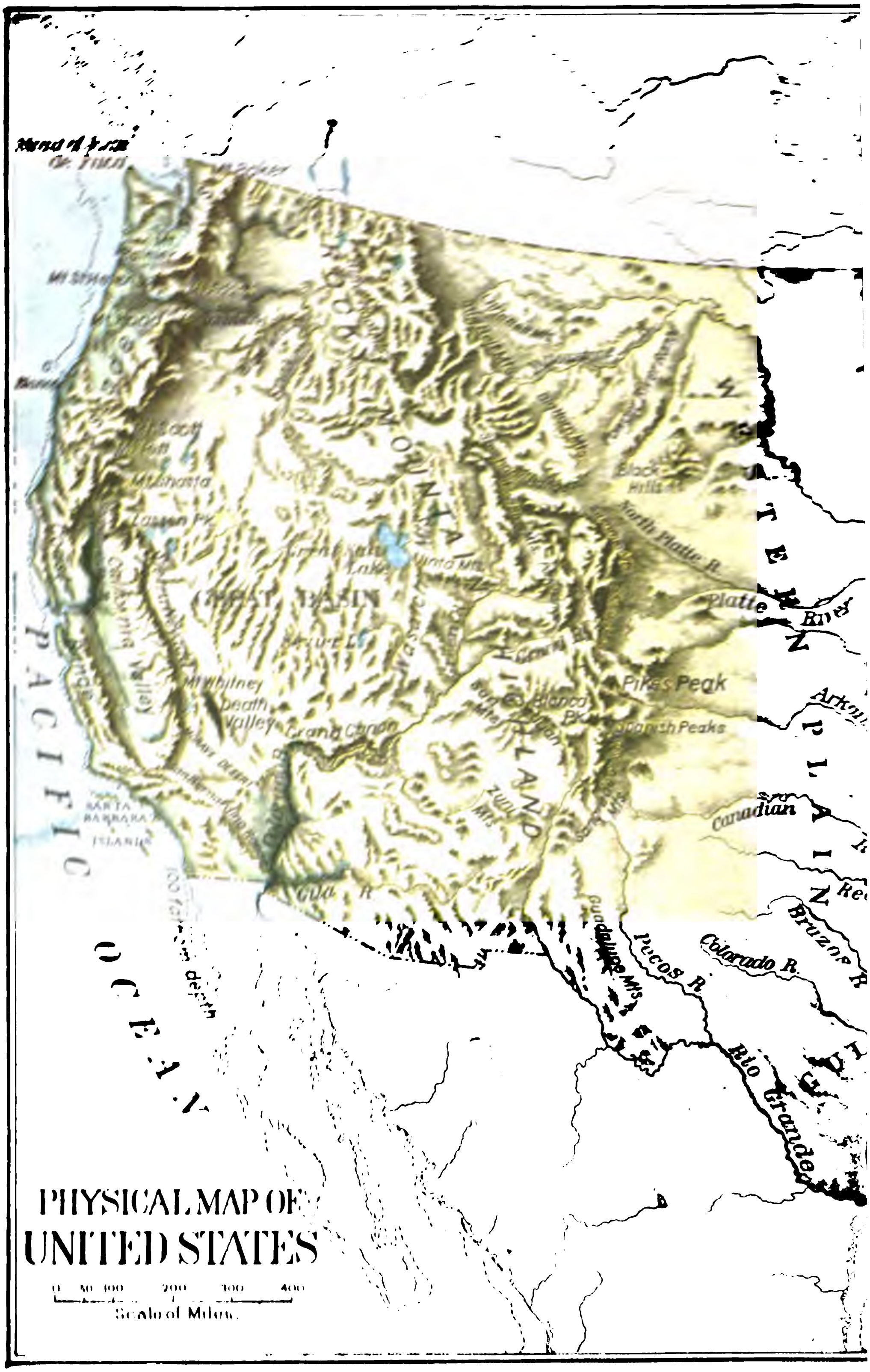
The average date of killing frosts in the spring and autumn determines the average length of the growing season for most of the important crops. The autumnal date is September 1st for the region from North Dakota to Lake Huron, and October 1st for the region from Colorado to Pennsylvania and northeastward along the New England coast. The latest spring frosts occur on May 15th from Idaho to Lake Superior and February 15th along the south Atlantic and east Gulf coasts. The growing season may be considered as the interval between the last frost of spring and the first of autumn, or it may also be defined as the season within which the average daily temperature does not fall below 40°. (See Maps accompanying article FROST.) From this point of view the growing season diminishes as one goes northward and amounts to about 120 days at the northern border of the United States. By a natural process of selection, stimulated by culture, plants that formerly required this length of time for maturity are now pushing northward beyond the borders into Canadian regions where the growing period is as much as twenty days shorter. Mr. Pennywitt of the Weather Bureau has published, in the *Monthly Weather Review* for February, 1901, three charts showing the dates on which the normal daily temperature at any place equals the annual mean at that place. There are two such dates for each station, dividing the year into the warmer half and the colder half. These are not quite the dates of frost, but generally come earlier than the frost in spring and later in autumn. His chart reveals the interesting fact that in general over the United States the warmer portion of the year is decidedly longer in duration than the colder season. This difference is greatest on the eastern slope of the Rocky Mountain range, and increases from thirty days in Texas and Kansas to forty-eight days on the northern border of Montana and probably increases somewhat as one goes north into Canada.

One of the most notable features in the climate of the United States is the great contrast between the Atlantic and Pacific coasts. This is due to the fact that the cold, dry air following each area of low pressure is confined in its movement southward between the Rocky Mountains and the Appalachian ranges. Occasionally dry, cold air descends from the north or northeast upon 'The Great Valley' of California with disastrous consequences, but in general the Pacific coast is under the influence of south and west winds, which bring abundant winter rains to northern California, Oregon, and Washington without severe cold weather. On the Atlantic coast the winter rains and snows are followed by very cold weather. The contrast between the mean temperatures on the immediate coast of the United States in January and July are shown in the following table. The temperatures here given are as read off on charts of isotherms, and refer to locations on the land at sea level near the shore. These temperatures are controlled largely by the prevailing winds and the adjacent oceans.

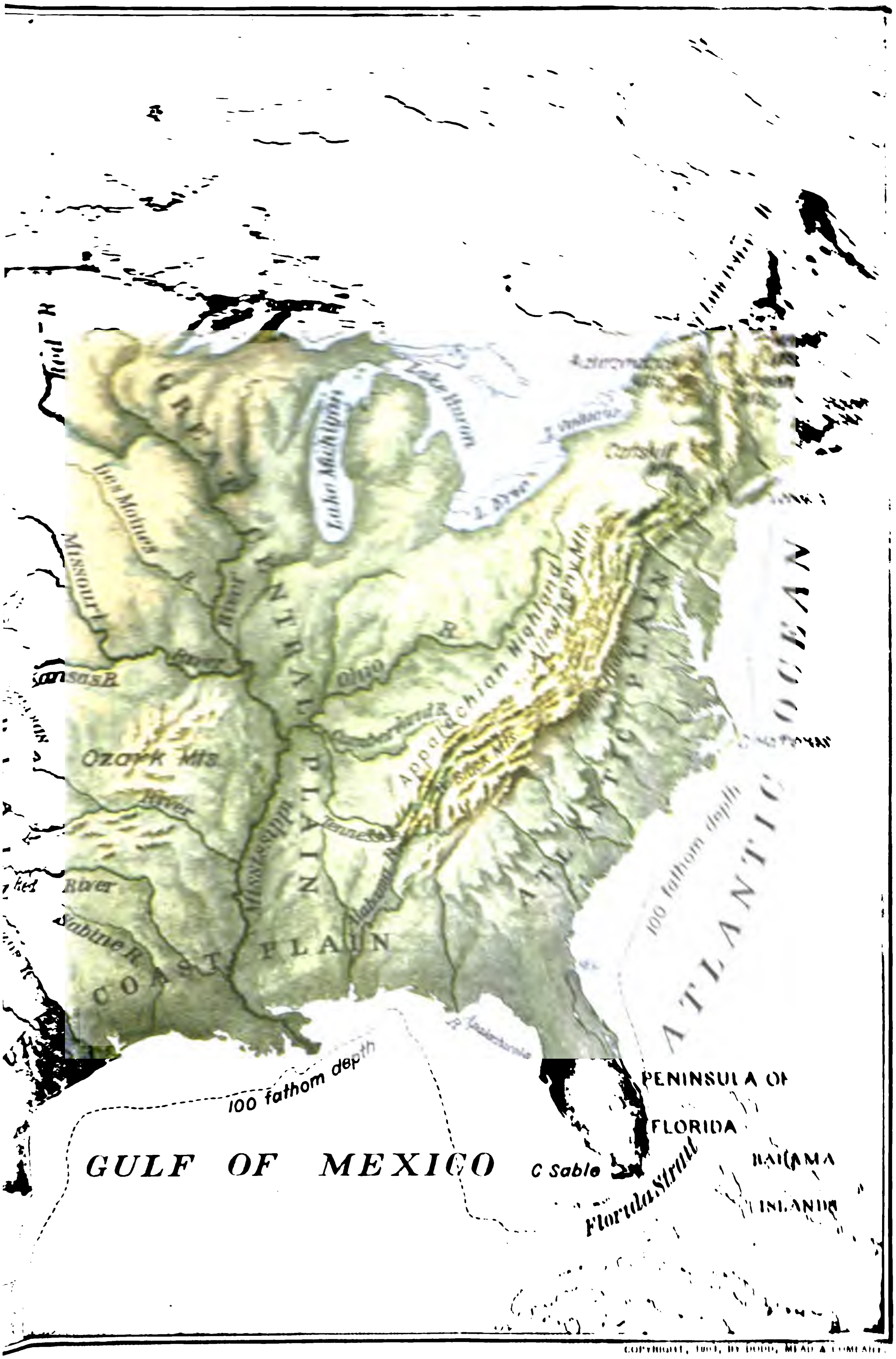
LATITUDE NORTH	January			July		
	Atlantic Coast	Pacific Coast	A—P	Atlantic Coast	Pacific Coast	A—P
50°..........	14°F.	41°F.	—27°F.	57°F.	55°F.	+ 2°F.
48	20	39	—19	58	57	+ 1
46	21	39	—18	61	59	+ 2
44	25	42	—17	64	59	+ 5
42	32	45	—13	68	59	+ 9
40	36	47	—11	75	57	+18
38	39	49	—10	75	57	+18
36	42	51	— 9	75	59	+16
34	47	54	— 7	76	62	+14
32	50	54	— 4	79	68	+11
30	58	56	+ 2	79	70	+ 9
28	60	60	0	79	75	+ 4
26	66	66	0	80	79	+ 1
24	71	68	+ 3	81	80	+ 1

Of course a similar great contrast prevails between the temperatures on the east side of Asia and west side of Europe, but nothing like this occurs in the Southern Hemisphere, owing to the presence of the great southern ocean and the small area and low altitude of the lands.

Another striking peculiarity in the climate of the United States is the great contrasts of dryness and rainfall. The heaviest precipitation and also a fairly uniform humidity prevail on the coast of Oregon and Washington; next to this are the humidity and rainfall of the coasts of Florida and the adjacent States. Throughout the Mississippi Valley and along the Atlantic coast from Cape Hatteras to Nova Scotia there are great fluctuations in moisture and evaporation. On the average the driest portion of the continent extends from southern California and Arizona eastward over the eastern slopes of the Rocky Mountain region. Not only is the rainfall here a minimum, but the humidity of the atmosphere is also very small and the proportion of the clear sky very large. Yuma, in Arizona, Santa Fe, in New Mexico, and Pueblo, in Colorado, have mean annual relative humidities of 43, 45, and 46 per cent. respectively. The amount of evaporation from the soil is correspondingly large in these regions, and artificial irrigation is quite essential for successful agriculture. Even the summits of the mountains of this portion of the continent show but little permanent snow, and that in sheltered spots. What would remain on the ground in an ordinary, moist climate is rapidly evaporated in this dry air. See map showing average annual relative humidity in the

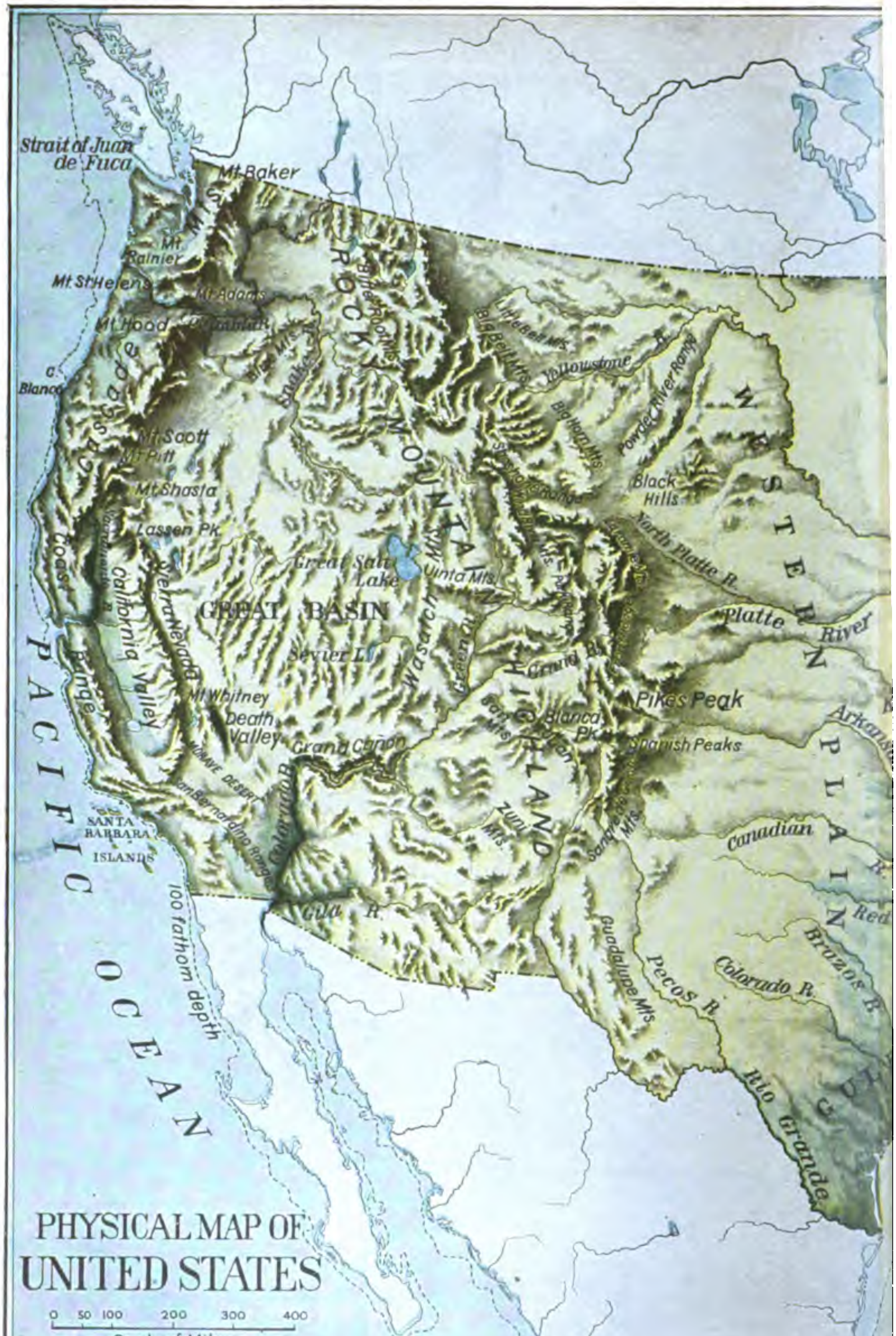


Lowlands, below 1,000 Feet elevation, are shown in Green.

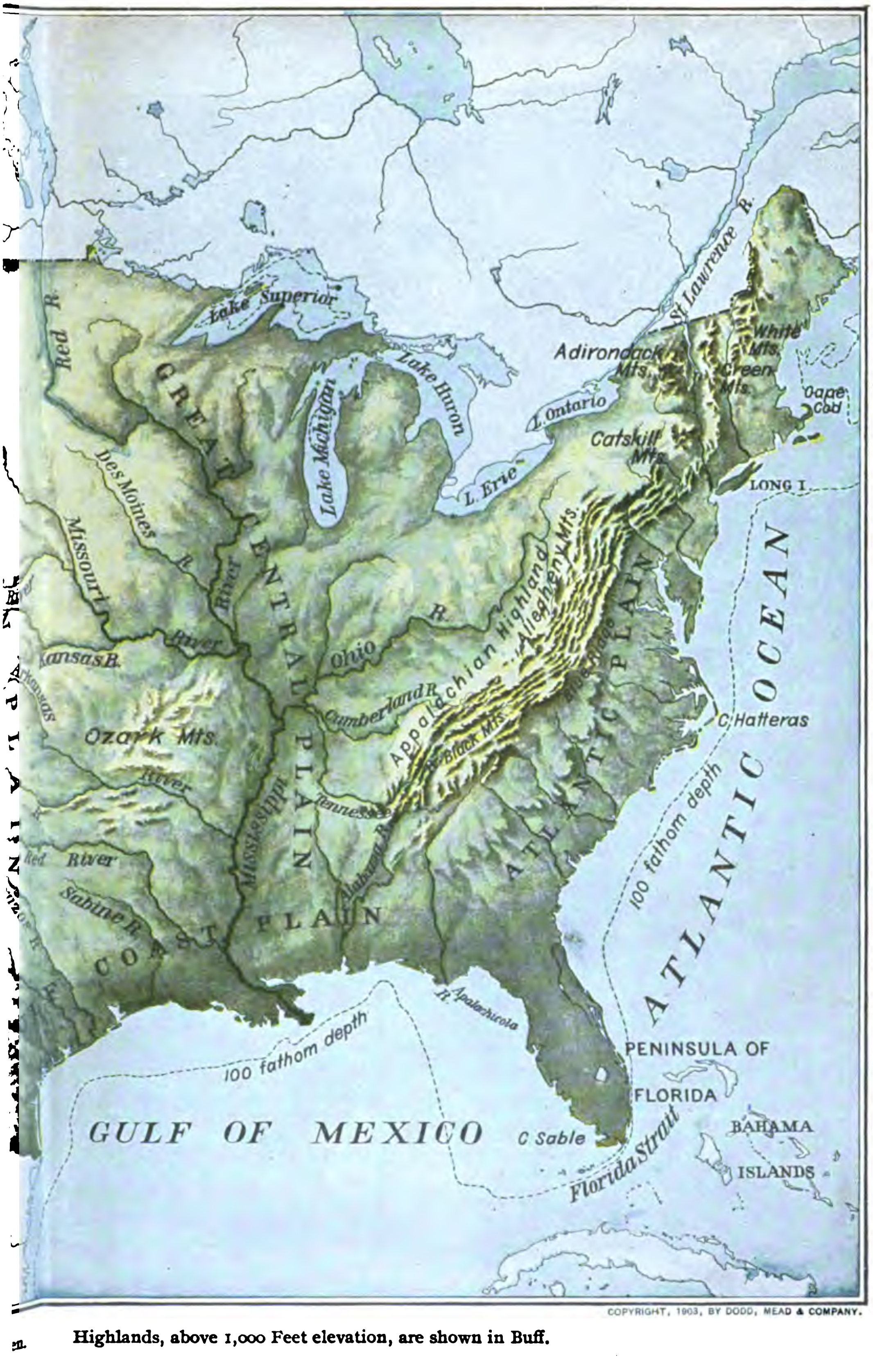


COPYRIGHT, 1902, BY DODD, MEAD & COMPANY.

Highlands, above 1,000 Feet elevation, are shown in Buff.



Lowlands, below 1,000 Feet elevation, are shown in Green.



COPYRIGHT, 1903, BY DODD, MEAD & COMPANY.

Highlands, above 1,000 Feet elevation, are shown in Buff.

United States, accompanying HUMIDITY. See METEOROLOGY; CLIMATE; STORM.

FLORA. The flora of the United States, when compared with that of Europe, is characterized by a far greater variety and wealth of species. This is especially noticeable in the trees, of which there are about 400 species in the United States, representing nearly all the European genera besides a considerable number of genera unknown in Europe, such as the hickories, magnolias, tulip tree, sassafras, liquidambar, and sequoia. Within the United States one finds also great differences between the various sections of the country, not only the natural differences due to climate as one passes from south to north, but also still more remarkable differences between the eastern and western sections. The latter are of course due in part to climatic variations, but in a large measure they are also due to the geological and topographical isolation of the East and West. Many of the most common trees, shrubs, and herbs of the Eastern States are unknown on the Pacific Coast, some of them being not even represented by cognate species. On the other hand, most of the characteristic species in the West are absent in the East. It is in the East that one finds the greatest local variety in vegetation, hundreds of widely different forms growing in luxuriant profusion side by side within narrow areas, while in the West there is much greater uniformity, immense areas being almost monopolized by a single species or at least a single type. The Eastern section is also the great forested area of the country. West of the Mississippi the forests rapidly disappear as one approaches the Great Plains, and reappear only on the mountains. Indeed, in the entire Western half of the country, with the exception of the northern part of the Pacific Coast, the forests are confined to the mountain slopes above a certain altitude, all the great valleys and lowlands being treeless except where irrigated by natural or artificial means.

Considering the country somewhat more in detail, one finds that it has been variously divided into floral regions. Under one of the most convenient and widely accepted systems the country is treated as belonging to eight such regions. Two of these are tropical, southern Florida and southern Texas, the latter being regarded botanically as a part of Mexico; two are subtropical or austral, the Southeastern Coast Region including the coast States from Texas to Virginia, and the Californian Region; the remaining four are temperate or boreal in character, namely, the Appalachian Region, including all the northeastern States north of the Southeastern Coast Region and east of the Mississippi; the Prairie or Great Plains Region, stretching from central Texas northward between the Mississippi and Rocky Mountains; the Rocky Mountain Region, included between the Great Plains and the Sierra Nevada-Cascade Range; and the Cascade Mountain Region, including the northern half of the Pacific Slope.

The flora of southern Florida is closely related to that of the West Indies and more remotely to that of South America. It consists largely of mangrove and cypress swamps and palm woods, with a profusion of vines and epiphytes, and including about 400 tropical species not found in any other part of the country. Southern Texas is a semi-desert area in which the mesquite and cacti predominate. The Southeastern Coast Region is characterized by large belts of pine forests in which the chief species are the long-leaf, short-leaf, and loblolly pine, as well as junipers, cedars, arbor-vitæ, and swamp cypress. The palmetto, the northernmost American palm, ranges as far as North Carolina. Other characteristic plants are the magnolia, live oak, and a number of evergreen angiosperms, as well as hickories and other trees common to the North.

The Appalachian Region has probably the most varied and luxuriant vegetation of all regions within the strictly temperate zones. This is due partly to the abundant rainfall coupled with the great and prolonged summer heat, partly to the fact that in this region a large number of Miocene plants survive side by side with the more recently evolved species. This is the great region of deciduous forests, and the one which contains nearly all the representatives of the European genera of trees, the oak, maple, ash, chestnut, elm, walnut, linden, poplar, beech, birch, etc., besides the strictly American trees, among which the tulip tree (*Liriodendron tulipifera*) is perhaps the finest and most characteristic example. Coniferous forests in this region are chiefly confined to higher ground, and the higher Appalachian Mountains have almost a typical Canadian flora, with their forests of hemlock, white pine, fir, mountain ash, and yellow birch. The undergrowth is also richly developed in this region, both in the mountains and lowland, and displays a wealth of vines and exquisite flowers, such as rhododendrons, honeysuckles, mountain-laurels, viburnums, and dogwoods. In the Great Plains Region the prevailing type of vegetation is the herbaceous, with grass predominating, but variegated with asters, sunflowers, and a number of other similar plants, while cottonwood and willows grow along the streams. In the Western plains the grasses give place to the sage-brush, and in the South, on the Llano Estacado, and in southern New Mexico and Arizona, to yuccas and cacti. In the Rocky Mountain Region the flora of the drier plains is extended into the valleys and lower plateaus, while the mountains are covered with coniferous forests. See paragraph *Flora*, under ROCKY MOUNTAINS.

The Californian Region, being protected by the lofty Sierras from the immigration of Eastern plants, has a flora unique in its numerous endemic genera and species. The forests, which, except in the north, are confined to the mountain slopes or the great central river valley, are almost wholly coniferous, and are especially remarkable for their gigantic trees. The giant sequoia, which grows nowhere else, ranks with the Australian eucalyptus as the largest forest tree on the globe. Enormous size is attained also by the redwood (*Sequoia sempervirens*), the sugar pine (*Pinus Lambertiana*), the Douglas spruce, and the giant cedar. The non-coniferous trees in California are not numerous, and are largely evergreen. There are several oaks, but few of the other Eastern trees. The Cascade Mountain Region is a northward continuation of the Californian Region, but differs from it in the absence of the sequoia and of the evergreen angiosperms, while deciduous trees are still more rare. The forests are of yet greater extent than in California, and reach down to the coast. The Douglas spruce, Western hemlock, noble fir, and giant cedar reach here their finest development. See Forestry.

Fauna. The fauna of the United States is an integral part of that of the Nearctic Province (q.v.), and is fully representative of that of North America described in the paragraph *Fauna* under America. (See also Distribution of Animals; and *Fauna* under Rocky Mountains.) With the exception of a few strictly boreal species, such as the musk-ox (q.v.), almost all the genera and species of North American animals of every kind are represented within the boundaries of the United States and its adjacent waters; and most of the Arctic absentees are found in Alaska (q.v.). Reference to the articles cited above and to such articles as Bear, Beaver, Bison, Dinosauria, Eagle, Extinct Animals, Fur-Bearing Animals, Fossil, Grouse, Horse, Oyster, Pronghorn, Puma, Quail, Rattlesnake, Salmon, Skunk, Turkey, Whale, Whitefish, and others, will give a conspectus of the fauna of the country.

Geology and Soils. North America, like other continents, combines very ancient areas with those that are geologically young. The primitive framework of the continent was drawn somewhat upon the lines of the existing mountain systems of the east and west, forecasting the Appalachian and Cordilleran uplands and the Mississippi lowlands of to-day. The oldest rock systems are known as Archæan and Algonkian. They are represented to the northward by an irregular V-shaped area inclosing Hudson Bay between its arms, and resting its blunted apex upon the north border of the Great Lakes. Extensions of this early nucleus are found along the Appalachians to Alabama, and consist of hard crystalline rocks of igneous and metamorphic origin, granites, gneisses, schists, marbles, and quartzites being among the common kinds. Such areas are the Adirondacks, some tracts in New England, the Highlands of the Lower Hudson and of New Jersey, South Mountain in Pennsylvania, with the Blue Ridge and Unakas of the Southern States. Other primitive masses are found in Wisconsin and Minnesota and form a straggling archipelago in the West, as in the core of the Black Hills, along the axis of the present Rocky Mountain Range, and in the Wasatch and Sierran regions. It must not be thought, however, that the present boundaries of these belts of ancient rock mark the shores of the ancient islands, but the lands now belonging to the United States began thus in narrow strips and patches, east and west.

The next younger but still very old formations belong to the Paleozoic era. This interval of geological time was very long, and includes an extended succession of periods, with their subdivisions or epochs. The rocks of the Cambrian, or earliest of these periods, are mainly sandstones, conglomerates, and shales, and are found in limited outcrops about the borders of the Archæan and Algonkian. The Ordovician, Silurian, Devonian, and Carboniferous formations, on the other hand, cover wide areas, especially in the Eastern United States. They constitute the bed-rocks of a region extending from the Archæan axis of the Appalachians, beyond the Mississippi River, reaching into eastern Nebraska, central Kansas, and far into Texas. From the Great Lake region they are found southward to middle Georgia and Alabama, but do not appear along the Mississippi south of the Ohio River. Thus at the close of the Paleozoic era the territory of the United States was a semi-continent on the east, sending lobate areas southward, with the Mississippi embayment between them. There was also rock accumulation and land growth in the Cordilleran region, but it still held a group of islands rather than a continental area. The largest western lands of Paleozoic age are in the region of the Great Basin, but the regions of the Colorado plateaus and of the coastal Pacific States were still sea, the Rocky Mountain belt was a chain of islands, and an unhindered sea swept from the tropical waters to the Arctic.

The Paleozoic era closed, in North America, with what is known as the Appalachian revolution, that is, with the disturbances which created the great series of folds which now extend from eastern New York to central Alabama. There had long been mountains in the east, as the Adirondacks and Blue Ridge. What their height may have been is not known. During Paleozoic time also the Green and Berkshire ranges of New England were formed. But there were then no mountains west of the Blue Ridge. During all the periods of the Paleozoic era, the waste of the older lands on the east and north was swept into an interior sea that ranged from central New York far to the west and southwest. Thus originated the sandstones, shales, and limestones of the Cambrian and succeeding periods, to which reference has been made. Along the old Appalachian border these formations acquired a thickness of several miles. In the mountain-building which ensued, these thick beds were crumpled and built into a range of high mountains. These mountains, having wasted away during the long periods which have since elapsed, leave to the United States the low ranges found now in Pennsylvania, and west of the Blue Ridge in Virginia and more southern States. With the building of the mountains there was a general uplift in the east, which permanently banished the sea waters from the eastern and central States of the Mississippi basin, except in the south.

During the Mesozoic era and the succeeding Tertiary period, the additions to the land areas of the east were confined to the Atlantic border and the Gulf region. From the enlarged lands of the east, following the Appalachian uplift, materials were available for further extension. In the west the growth was interior as well as on the border, and these later times are marked by the filling in of partially inclosed seas, and by retreat of waters, due to massive continental uplift. Thus gradually the western interior sea of the Great Plains region disappeared (as did that of the Colorado basin), and the Pacific shore line was pushed to its present position.

Some of the important episodes of Mesozoic and Tertiary continental evolution may now be noted. The eastern border region has a series of areas of red and brown shale and sandstone, of Triassic age. These formations underlie the lowlands of the Connecticut Valley in Massachusetts and Connecticut. Another belt extends from the Palisades of the Hudson into Virginia, and there are other and smaller areas. Associated with these rocks are the lava sheets which form the Orange Mountains of New Jersey, the Palisades of the Hudson, and the Mount Holyoke range of Massachusetts. These rocks are known as the Newark formation and were not accumulated in the open sea, but in brackish or fresh waters, in basins whose character is little known. The Cretaceous and Tertiary beds of the Atlantic border form southern New Jersey, and the outside lowlands of all the States southward to Florida, and make the coastal plain of this region. They slant gently down and become continuous with the beds that lie below the marginal waters of the Atlantic. Owing to their comparative recency, they are often partially or wholly unconsolidated and occur as sands, gravels, clays, and marls. But they may consist also of well-indurated sandstones and limestones.

Similar statements may be made concerning the formations and the lands that border the Gulf. Here belongs the entire State of Florida, which is already given. It is low not because of denudation, but because of gentle and limited uplift of the undisturbed and youthful strata which lie beneath its surface. As has been intimated, the ancient Mississippi discharged, not far from the present mouth of the Ohio, into a gulf that thus lay between south-reaching lands on the east and west. Its successive burdens of land waste served gradually to fill the embayment, and its delta reached more and more to the south, encroaching, as it is still, upon the Gulf.

Mesozoic deposits of Triassic, Jurassic, and Cretaceous age are found along the eastern base of the Rocky Mountains, where they are upturned at various angles, as in the vertical or highly inclined strata of the Garden of the Gods. Eastward, at a little remove from the mountains, these beds, which have yielded perhaps the most remarkable series of fossil vertebrate remains that have been obtained in any country, become horizontal and are often covered with still younger stratified formations, which all together make the underlying masses of the Great Plains. The breaking and upturning of the strata seen in the Rocky Mountain foothills points to the main uplift of these mountains which took place at the close of the Mesozoic era.

After the Rocky Mountain revolution, the Great Plains area ceased to be a region of salt-water deposition and was characterized by swamps, and great lakes of brackish or fresh water. The Laramie formation belongs to this era of low-lying lands in that region when the sea was excluded, and some of the largest coal deposits of the West were accumulated in the marshes of the time.

Over many thousands of square miles in Colorado, Kansas, Wyoming, and Nebraska are sheets of incoherent or partly consolidated gravels, sands, and clays, which have usually been attributed to sedimentation in such lakes. It is probable, however, that in part, at least, these beds are due to torrents carrying down enormous volumes of waste from the mountains and distributing it in their wanderings over the plains. Present conditions were not approached in this region until the late Tertiary. By that time the entire belt, including the plains and Rocky Mountains, had received a massive uplift, by which the lakes were drained, and the plains given an eastward slant, from altitudes of 5000 to 6000 feet at the base of the mountains, to the low prairies west of the Mississippi River.

The rocks of the Colorado plateaus consist of some thousands of feet of sedimentary beds of Mesozoic and younger rocks, overlying a Paleozoic and Archæan foundation. The Colorado River furnishes a great natural section, since for some distance it has sunk its channel through the Paleozoic strata and cut far down into the basal granites. Like the Great Plains, it was long a region of marine deposition, followed by lakes and streams as the lands emerged. Here, too, great and widespread uplifts took place, in which the strains were so great as to produce profound fractures and dislocations or faults, and attended at times by large outflows of lava. These upflows sometimes stopped below the surface, and domed up the overlying strata, making a kind of mountain known as laccolithic, of which the Henry Mountains, in Utah, are the type. Largely by such faults, running in a north and south direction, the ancient strata of the Great Basin have been cut into large blocks, and so tilted that the higher edges of the blocks make the parallel ranges of Utah and Nevada.

The initial uplifts of the Sierran mountain belt were made in Mesozoic time, and the strata involved were formed from the waste of the older lands in the present Great Basin region to the eastward. But it was not until late Tertiary time that the entire block or mass of the Sierras was lifted to a great height and tilted to the west. In connection with this uplift a lofty fault scarp developed, which now forms the steep eastern front of the mountains. This crest, therefore, is toward the east, and the principal drainage is down the gentler western slope into the valley of California. The Sierras continue northward as the Cascade Mountains of Oregon and Washington. The Willamette Valley in Oregon and the Puget Sound Valley in Washington are the analogues of the valley of California, and they are separated from the ocean by a young range of mountains, known in its various parts as the Coast Range, the Klamath Mountains, and the Olympic Mountains.

Thus it appears that the Western United States have had a composite history. It began with island nuclei which grew by sedimentation and uplift. The several great ranges of mountains mark several periods of folding, faulting, and uplift, while both mountains and plains rose by massive and wide-ranging or continental movements, thus adding to the height of the mountains and making the plains into plateaus of from 3000 to 8000 feet in altitude. With these disturbances, especially in Tertiary times, were the most extensive outflows of lava of which this continent shows any record. These are found either as remnant sheets and volcanic necks, or as vast sheets scarcely changed since their outflow. They occur in nearly every Cordilleran State, as on both sides of the Rocky Mountains in Colorado, in New Mexico, in Utah, in Mount Shasta, and the great cones of the Cascades, and especially in the lava plateaus of the Snake and Columbia rivers in Idaho, Washington, and Oregon. As a lingering episode of their interior volcanic energy we may, perhaps, recognize the geyser phenomena of the Yellowstone Park.

Through all the periods which have been passed in review, the process of land sculpture was active and all varieties of relief have been shown, even in the same area, in successive cycles of denudation and uplift. Thus New England is everywhere mountainous in structure, although much of its surface is now reduced to hills, and to valleys whose bottoms are not far above base level. The Connecticut Valley, as it now exists, is rather a product of downwear along its course than of uplift on its sides. The same is true of the Hudson, and, indeed, of all the valleys of the Appalachian region. Much of the Archæan core of this Eastern mountain system is well worn, like the coastal parts of New England. Such a region is the Piedmont belt of hills and low mountains lying between the Blue Ridge and the coastal plain in the South Atlantic States. So, too, the Appalachian Mountains of post-Paleozoic age were perhaps raised to Alpine heights, but have been greatly reduced and given their present relief of ridge and valley by processes of wasting and the survival of more resistant formations.

The strata of the Mississippi basin have for the most part never been raised to considerable heights, and the streams have not had sufficient vigor to be the instruments of largest denudation. But among the mountains and plateaus of the Cordilleran region the land forms owe their reliefs to long continued denudation, conditioned by the composition and structure of the rocks. For example, in the Grand Cañon region, or more broadly, everywhere among the Colorado plateaus, vast thicknesses of the upper strata have been bodily removed. Those that remain present south-facing escarpments of ragged outline, and their masses are in turn profoundly dissected by the swift river and its branches. The true measure of denudation is not the cañons, however, but the amount of stripping that has been accomplished over the whole region. Similarly, the lava sheets have been deeply channeled, as by the Snake River, or have often been nearly removed, and volcanic cones are in all stages of decay, from the little marred Mount Shasta to the 'necks' that mark the complete disappearance of overlying cones.

The principal reliefs were given to the country prior to the glacial invasion. But within the field of glacial movement important changes were effected, and in some cases the combined effect of the wearing of hill and mountain tops, and of the filling of valleys, was to diminish the total relief by several hundred feet. The territory affected includes all of New England, the Middle States into northern New Jersey and Pennsylvania, and the Central States to lines not far from the Ohio and Missouri rivers. Eastern Nebraska was included, with much of the Dakotas, Montana, and the more northern Cordilleras. Small remnant glaciers are still found in the high Sierras, on the volcanic cones of the Cascades, and in Montana and Colorado. The general effects of the ice sheet were the grinding and transport of rocky waste, coarse and fine, the commingling of this material with the preëxistent soils, the formation of moraines and other bodies of drift during retreat, the blockading of ancient valleys causing innumerable changes of drainage, and the formation of thousands of lakes.

Since the departure of the ice, or during post-glacial time, many of the smaller or more shallow lakes have been filled by sediment, or by deposits of vegetable origin, sometimes forming beds of peat. In the larger lakes deltas and marshy areas have been formed in the same manner. The interrupted streams have resumed their flow along the lowest line of levels that they could find, and in so doing have often cut through the veneer of drift and worn deeply into the underlying rock. This is the origin of most of the gorges of the Northern States. They are young, post-glacial valleys, and the old, buried channels are often to be found not far away. These conditions have not only produced striking scenic results, in the gorges and waterfalls of the Northern States, but have created nearly all the available water power of the same region. Before the ice invasion many streams flowed at lower levels, in the deep and mature valleys of the time. But the obstruction of these valleys has compelled the streams to flow at greater altitudes, and the rocky masses and spurs encountered in their downcutting have caused a concentration of descent in rapids or falls, and thus have made the streams a source of power, while at the same time obstructing the otherwise open ways of commerce.

The soils of the country may roughly be divided into two classes by virtue of their origin. Outside of the glacial region they are known as residual soils, being in the main the product of the local rock disintegrating in place. In this case the more soluble minerals, such as calcium carbonate, have largely been removed. The chief movements of such soils have taken place along the course of rivers and by means of them. The soils of the Lower Mississippi are an illustration of this latter phase, having been gathered from all parts of its basin. The remaining soils are glacial. The ice sheet invaded the residual soils of pre-glacial time, plowed them up, pushed them forward greater or less distances, and thoroughly mingled them with materials often coarse, and mechanically derived from the rocks lying in the track of the glacier. These soils, therefore, partake of the variety of the numerous rock masses from which they have been derived.

FISHERIES. The United States fishing industry originated in New England shortly after its settlement, and was gaining considerable prominence until England attempted to place restrictions upon it. It also was seriously damaged by the War of 1812, as well as by subsequent conflicts between American and British interests. The extermination of certain species of fish has at various times seemed probable, due to a lack of definite knowledge regarding the habits of the animals, and the fact that there were no limitations placed upon the number which could be captured. Measures have of late years been enacted which to a large extent have obviated these difficulties. (See FISHING LAWS.) The United States Fish Commission, by its establishment of hatcheries and its investigations and experiments, also, has aided greatly in the development of the industry. (See FISH; FISHERIES; and FISH CULTURE.) The chief centres of fisheries are naturally those States bordering upon the Atlantic, Pacific, and Gulf coasts and Great Lakes, the Mississippi Valley, and Alaska. The following table shows the status of the industry for the years 1880, 1890, and 1900, the figures for 1900 being estimates based on the latest reports of the United States Fish Commission:

YEAR	Number of persons employed	Invested capital	Value of products
1880	131,246	$37,955,349	$42,740,163
1890	163,348	43,602,123	44,277,514
1900	213,000	71,600,000	46,500,000

In the New England States the principal products are cod, halibut, and mackerel. Massachusetts leads in the value of products, while Maine has the greatest number of persons engaged in the industry. Maryland ranked first among the Middle Atlantic States which are especially concerned in oyster and shad fishing. Shad and oysters are also the leading fish products of the South Atlantic States. The Gulf States produce oysters and sponges. Among the Gulf States Florida holds first place in the fishing industry. Of the fish output of the Pacific States, about half is represented by salmon. Herring, lake trout, and yellow perch are the leading products of the Great Lakes division. The period of greatest development in this region was from 1880 to 1885, when the number engaged in the industry and the value of the production increased 100 per cent. The yield of the Mississippi Valley exceeds in quantity and nearly equals in value the combined production of the remaining interior waters of the United States, except the Great Lakes. Buffalo-fish, catfish, and German cod are especially plentiful. Alaska is the centre of the fur-seal industry, and is also noted for its large number of cod, halibut, and other deep-sea fish. (For further details, see the several State articles; the articles on WHALE, SEALING, etc.; and also articles on the various fish species: COD, MACKEREL, MENHADEN, etc.) The exports of fish and fish products have greatly increased in value since 1870, but during the period 1890 to 1902 they remained practically stationary. The value of the exports in 1902 was $7,705,065. Europe was the destination of over half the output. Canned salmon formed the largest single item. The value of the imports of fisheries has increased from $5,457,785 in 1892 to $8,527,097 in 1902. The largest part of the import trade is with Canada. The main items of importation are pickled herring and dried cod in the cured list, while lobster is the chief product in the class of fresh fish. In the census year 1900 there were 348 establishments concerned in fish curing, packing, and canning. The total value of their product was $22,253,749. The curing of cod, herring, and mackerel, the canning of sardines in the New England States, and salmon-packing in the Pacific States are the leading fish interests in the United States.

MINING. Prior to the nineteenth century the mining industry in the United States was quite insignificant, and it was not until nearly 1850 that it began to be important. Since that period the industry has developed with a rapidity equal to that of manufactures and transportation. It is significant that the production of the mines constitutes over one-half of the total freight tonnage handled by the railroads. In 1902 the United States had advanced to first rank in the production of most of the useful minerals, and the total value of the combined mineral ouput was far greater than that of any other country. The growth of the industry since 1880 is seen in the following table:

YEAR	Metallic products	Non-metallic products
1880	$190,039,865	$173,279,135
1890	305,872,422	312,776,503
1897	302,531,147	327,655,427
1901	524,873,284	566,351,096

To the above should be added an unspecified sum amounting in value to $6,000,000 in 1880, and to $1,000,000 in each of the other years given. The total mining output for 1901 was valued at $1,092,224,380. The United States probably has more mineral lands in proportion to its total area than any other country. Nearly every mineral that is needed in the arts is mined.

COAL. Coal is the most widely distributed mineral and is far in advance of any other in the annual value of its output. It is regularly mined in thirty States. (For localization of coal areas, see article COAL.) The area of the coal fields, not including those occurring in the Rocky Mountains and Pacific Coast States, is about 220,000 square miles. Of this only a small portion consists of the anthracite variety, which is almost wholly confined to the middle-eastern portion of Pennsylvania. Authorities have not attempted to estimate the probable duration of the supply of bituminous coal, but it has been estimated that the anthracite would last at the present rate of consumption one hundred years. Bituminous coal mining began regularly in 1750, while anthracite mining did not begin until fifty years later. The production of each was very small for a number of years. The rapid growth of the industry did not begin until after the Civil War. From the following table it will be seen that the output of bituminous coal has doubled for each decade since 1870. The output of anthracite was five times as great at the end of that period as at the beginning. The total production of coal in short tons in 1870 was 33,003,315; in 1880, 73,647,997; in 1890, 156,073,611; in 1900, 293,298,516. The following table shows, in short tons, the production of coal in the ten leading States in the years 1870, 1880, 1890, and 1901.

In 1866 Great Britain produced six and one-

STATES	1870	1880	1890	1901
Pennsylvania (anthracite)	15,650,275	26,249,711	46,468,640	67,471,668
Pennsylvania (bituminous)	7,798,517	21,280,000	43,302,173	82,305,946
Illinois	2,624,163	4,480,000	15,274,727	27,331,552
Ohio	2,527,284	7,840,000	13,203,522	20,943,807
West Virginia	618,878	1,404,008	6,002,800	24,068,402
Alabama	10,999	380,000	4,090,409	9,099,052
Maryland	1,819,824	2,692,497	3,357,813	5,113,127
Iowa	263,487	1,792,000	4,021,739	5,617,499
Colorado	4,500	375,000	3,075,781	5,700,015
Indiana	437,870	1,680,000	3,305,737	6,918,225
Kentucky	150,582	1,120,000	2,483,144	5,469,986

half times as much coal as the United States. In 1899 it was surpassed for the first time by the United States, and in 1901 the United States led by 42,790,730 tons. American coal is more easily mined than the coal of most countries, and the product sells at the pit cheaper than pit coal sells in any other part of the world. The total value of bituminous coal in 1901 was $236,201,899, and of anthracite $112,504,020. It will be seen from the above table that the Appalachian region has always contributed the bulk of the product. In spite of the enormous absolute gain in Pennsylvania, its relative importance has declined. West Virginia and Alabama are two of the fastest developing coal-mining States. The greater development of the Appalachian region is not due to the greater abundance of resources, although the quality of the Eastern product is generally superior to that of the West. It is due rather to convenience to the market. The thickly populated region to the north and east of Pennsylvania is without coal, and a large part of the anthracite product is consumed in that region for household purposes. Pennsylvania is also the most convenient coal-producing State so far as nearness to the industrial centre of the country is concerned, and a large part of its bituminous product is consumed in its own large iron manufacturing and railroad establishments. Its proximity to the shipping facilities of the Ohio River early gave it a command over the markets reached by the Ohio and Mississippi waterways. The want of a local market and the lack of railroad facilities have been against the development of the southern Appalachian coal region.

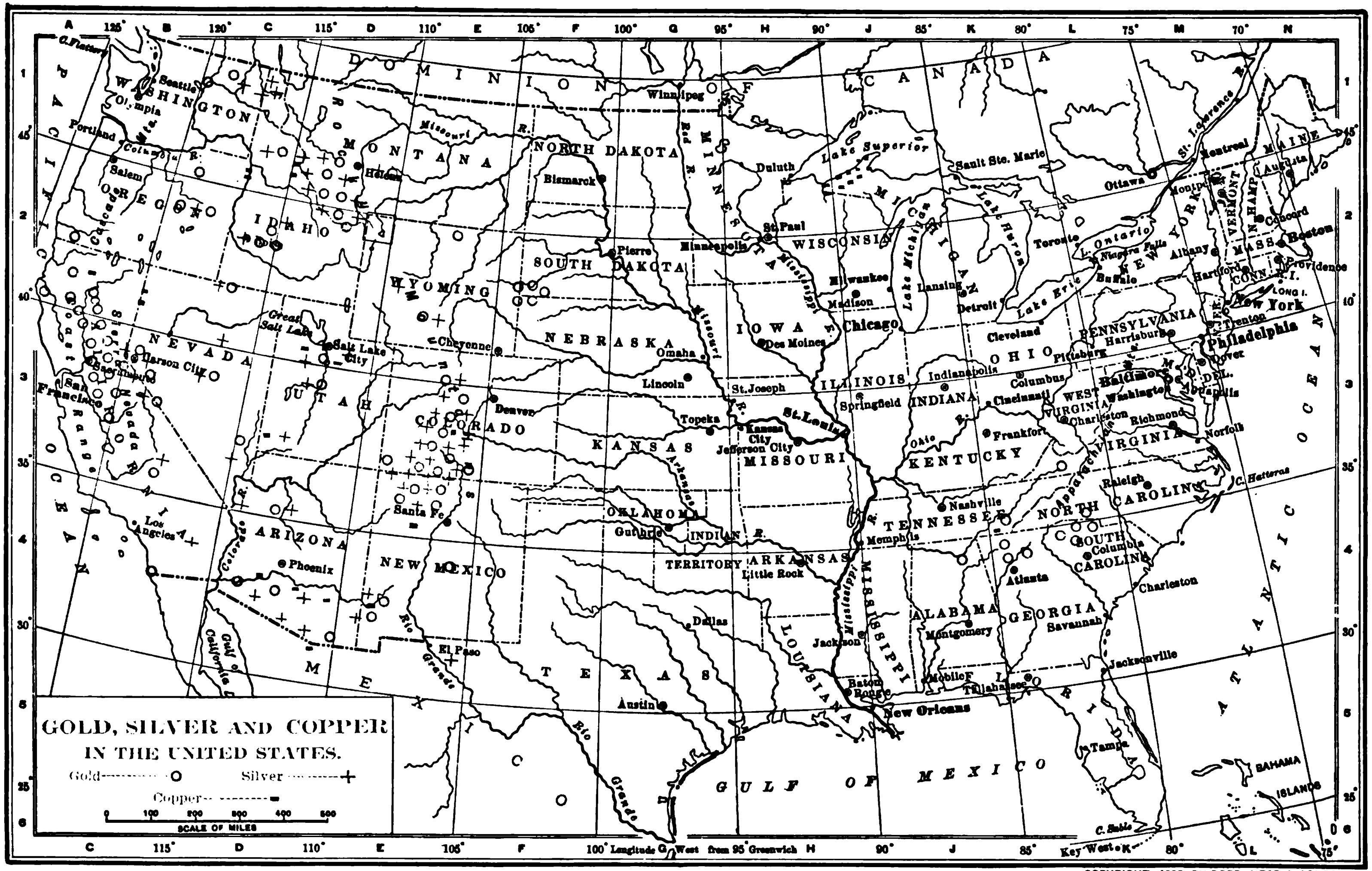
Petroleum. The production of petroleum began in western Pennsylvania in 1859. The United States soon became the chief source of the world's supply of this article. The recent development in Russia, however, has since 1897 placed that country ahead of the United States in rank. The production of the country increased slowly to 6,293,194 barrels in 1872, and then more rapidly to 45,823,572 barrels in 1890, and 69,389,194 barrels in 1901, the value in the last year being $66,417,335. The output in Pennsylvania reached its maximum in 1891, when it amounted to 33,009,236 barrels. Since that year the product has declined in that State until in 1901 it was only 12,625,378 barrels. About 1886 Ohio came into prominence in the production of petroleum, the output advancing rapidly to 17,740,301 barrels in 1891, and 21,648,083 barrels in 1901. The petroleum industry began early in West Virginia, but did not develop rapidly until in the last decade of the nineteenth century, the output increasing from 492,578 barrels in 1890 to 14,177,126 in 1901. The industry also developed slowly in California until 1899, increasing its output more than twofold in the following two years, the product in 1901 being 8,786,330 barrels. The production in Indiana did not begin until 1889, but has advanced steadily until 1901, when it amounted to 5,757,086 barrels. The last State to develop its resources of petroleum is Texas, the output having advanced from 50 barrels in 1895 to 4,393,658 barrels in 1901. In 1902 and 1903 important discoveries were made in Louisiana which is destined to become a large producer of petroleum. See Map under Petroleum.

Natural Gas. Natural gas has been extensively exploited in some parts of the United States in recent years. It began to come into use in western Pennsylvania after 1875, and by 1880 the value of the product for that State was estimated at $19,282,375. The production then declined until its value was less than one-third this amount, but revived during the four years ending with 1901, the production in that year being valued at $12,688,161. After 1885 Ohio and Indiana began to produce large quantities, but there was an early decline in Ohio, the value of the output in that State in 1901 being only $2,147,215, while Indiana more than held its own, the value for the same year being $6,954,566. Since 1895 extensive developments have occurred in Kansas and West Virginia. The total value of the natural gas for 1901 was estimated at $27,067,500, an amount twice as great as the reported value for 1897.

Iron. Iron-mining ranks in importance next to coal, iron ore, like coal, being very widely distributed in the United States. In 1901 25 States reported its production. The mining of iron began in early colonial days and it was the first mineral mined in the country. However, it did not rise into importance until near the middle of the nineteenth century. From a total output in that year of 1,560,442 long tons there was a steady increase to 5,250,402 long tons in 1870, 16,276,584 long tons in 1890, and 28,887,479 long tons in 1901, valued at the mines in the last-named year at $49,256,245. The production of pig iron exceeded that of Great Britain for the first time in 1890, and in 1902 was over twice as great, and equaled the combined output of Great Britain, Germany, and Belgium. Of the total output in 1901 the red hematite variety amounted to 24,006,025 long tons, brown hematite 3,016,715, the magnetite 1,813,076, and the carbonate 51,663 long tons. The Lake Superior ore is almost wholly of red hematite variety. The Virginias are the largest producers of brown hematite. Pennsylvania and New Jersey yield the largest quantities of magnetite. Alabama and Tennessee produce considerable quantities of both red and brown hematite. Prior to 1870 Pennsylvania was the chief iron-producing State, and yielded in that year 44 per cent. of the total product. This and other States east of the Appalachian Mountains produced 62 per cent. of the output for that year. Since then other regions have so far outstripped Pennsylvania and other Eastern States that the

Production of Iron in Long Tons

	1850	1870	1891	1901
Minnesota	....	....	645,105	11,109,537
Michigan	2,700	859,507	6,127,001	9,654,067
Alabama	1,838	11.350	1,986,830	2,801,732
Pennsylvania	877,283	2,337,286	1,272,928	1,040,684
Virginia and West Virginia	67,319	84,108	665,116	925,394
New York	46,385	446,945	1,017,216	420,218



GOLD, SILVER AND COPPER IN THE UNITED STATES.

COPYRIGHT, 1902, BY DODD, MEAD & COMPANY.

latter have become comparatively unimportant, as will be seen in the preceding table.

To this should be added in 1901 Wisconsin and Tennessee each with over 700,000 tons, and Colorado and New Jersey with over 400,000 tons each. The development of the Lake Superior iron region is one of the most significant of recent industrial movements in the United States. It has been rendered possible largely through the advantage afforded by the Great Lakes for transportation. With the improvement of the canals connecting the lakes and the increased tonnage of vessels there has been a resulting decrease in freight rates and a greater impetus given to the mining industry. (See section on TRANSPORTATION.) The industry has also profited by the improved methods adopted to facilitate the transfer of the ore in transit and especially by the use of machinery and the mining operations themselves. Furthermore, in the principal mining range—Mesabi—the ore is sometimes found so near the surface that with the removal of a few feet of earth it is mined by the open-pit method, the ore being scooped by huge steam shovels directly from the pit to the car. Probably in no other mines in the world does massive machinery play so great a part in mining operations and hand labor so little. Work in the Mesabi Range began in 1892, and the output grew rapidly until 1901, when it amounted to 9,303,541 long tons. The Southern iron region shares with the Northern Appalachian region in the advantage of having coal and limestone, two essentials in the reduction of the ore and found in close proximity to the ore itself. The South has the additional advantage of cheap labor, but it is under the disadvantage of having a limited local market.

GOLD. The mining of gold on an extensive scale did not begin until the discovery of the placer gold in California in 1848. Between 1820 and 1830 some interest had developed in the States of Virginia and North and South Carolina, and for a number of years the output averaged about $1,000,000. In 1850, within two years after the California discoveries, the output was $50,000,000, and it did not fall below this figure until 1860. The product greatly exceeded in total value the value of all other minerals mined during that period. The gold output has ever since been large, though subject to fluctuation. As ordinary placer mining began to be unprofitable, quartz mining and hydraulic mining were resorted to, and California continued to be an important gold-mining State. The working of placer mines in Montana between 1860 and 1870 helped greatly to sustain the high record which California had earlier established, Montana being credited in one year (1866) with an output valued at $16,500,000. Considerable amounts were contributed also by other Western States, particularly by Nevada, owing to the Comstock Lode. With the exception of two years the annual output from 1871 to 1895 stood below $40,000,000. With the decline in the value of silver, attention was turned to gold. Improved methods of mining and of extracting the metal from the ores reduced the cost, and made possible the working of mines that were unprofitable under the old methods. Almost every Western mountain State has shared in the increase that raised the total output of gold from $33,000,000 in 1892 to $78,666,700 in 1901. Colorado took first rank in 1897 and in 1901 produced $27,693,500. California ranked second with an output of $16,891,400. South Dakota, Utah, and Arizona are three of the most rapidly developing sections. Alaska's (q.v.) contribution in 1901 was $6,885,700.

SILVER. The development of silver-mining in the United States was almost as sudden as was that of gold. The production of this metal had been quite insignificant until the discovery of the Comstock Lode (q.v.) in western Nevada in 1859. The United States then became the leading silver-mining country of the world. The only other nation that now competes with it in this industry is Mexico. The output of the Comstock Lode declined rapidly after 1877. Nevertheless other mines were developing, and the silver product of the country continued to increase. The two largest contributors to this increase were the lead mines of Colorado and later the copper mines of Montana, large quantities of silver being extracted from both the lead and the copper ores. The total output, after falling to 49,501,122 ounces in 1894, had increased to 59,653,788 ounces in 1901, the commercial value of which at the mines was $35,792,200. Over one-third of the total product in the latter year was produced by Colorado, Montana and Utah yielding the greater part of the remainder.

COPPER. Very little copper was mined prior to the development of the Lake Superior copper mines, which began operations in 1845. From that year the product has continued to increase steadily and rapidly. In 1866 the famous Calumet and Hecla mine was opened, and in 1890 its annual product had grown to 59,868,106 pounds, and in 1901 to 82,519,676 pounds. In 1880 Lake Superior ores furnished 82.2 per cent. of the total product of the country. About this time Arizona began to figure prominently in copper-mining, and a little later Montana also, the latter advancing so rapidly that in 1885 it produced 40.9 per cent. of the total product, as against 43.5 for Lake Superior and 13.7 for Arizona. Though the Lake Superior output continued to increase, its per cent. of the total had fallen to 25.9 in 1901. Montana more than doubled its output in the decade ending 1901, producing in that year 38.2 per cent. of the total product, while Arizona increased its output three and one-half times in the same period, having 21.7 per cent. of the total product in 1901. In the last years of that decade California and Utah rapidly advanced in their output of copper. The principal Montana mines are located at Butte, the largest mining centre in the world. The Anaconda mine produced, in 1901, 101,850,224 pounds, and the Boston and Montana nearly half that amount. In Arizona the Copper Queen yielded 39,781,133 pounds, and the United Verde 34,520,695 pounds. The total output for the United States increased from 27,000 long tons in 1880 to 115,966 in 1890, and 268,782 long tons in 1901, these amounts being respectively 17 per cent., 43 per cent., and 53 per cent. of the world's product. The value of the output in 1901 was $86,629,266. The United States is now the controlling factor in the world's copper markets.

LEAD. The United States ranks first among the countries of the world in the production of lead. The mining of this mineral began as early as 1720 in the southeastern part of what is now

Missouri, but it was not until a century later that operations assumed much importance. About 1825 mining began in the region which includes the adjacent corners of the three States of Wisconsin, Illinois, and Iowa, and later in southwestern Missouri and the adjacent corner of Kansas. For a number of years the mining of lead was, after iron, the most important metal-mining industry in the United States. It was mined in Utah in 1858. About 1875 work began on the Leadville Mine, Colorado. The Leadville ores are argentiferous, and the silver obtained in the early days of mining was of greater value than the lead itself. A little later argentiferous lead mines were developed in Idaho (Cœur d'Alêne) and other Cordilleran States. The total product of the country increased from 8000 short tons in 1830 to 30,000 in 1845, then decreased to 14,700 in 1865, since which time it increased almost steadily to 97,825 short tons in 1880, 178,554 in 1891, and 270,700 short tons in 1901, valued in the latter year at $23,280,200. Of the total only 57,898 short tons were soft lead, the remainder being desilverized lead. Idaho, Colorado, and Utah in the order named led in importance, the Mississippi Valley mines producing the greater part of the rest.

Zinc. Zinc-mining in the United States is limited chiefly to the lead-mining region of the Mississippi Valley above described. Its development began about 1850. Northern New Jersey at one time yielded considerable quantities of spelter, but its output has declined in recent years. The total product of zinc increased from 7343 short tons in 1873 to 63,683 in 1890 and 140,822 in 1901, giving the United States second rank among the countries of the world. The principal contributing States were Kansas, 74,240 short tons; Illinois, 44,896; Missouri, 13,083; and all other States, 8603. The value of the product was $11,265,760.

Clay. The various kinds of clay suitable for brick, tile, pottery, and other purposes are widely distributed and largely exploited. The total value of the different products made in 1901 was $110,211,587. Ohio is the largest producer, followed by Pennsylvania, New Jersey, Illinois, and New York, in the order mentioned.

Quicksilver. The mining of quicksilver began about 1845 in California, and its production has been confined almost wholly to that State. The output in 1900 was 29,727 flasks (76½ pounds per flask), valued at $1,382,305. The United States rivals Spain for first rank.

Aluminum. The production of aluminum began in 1883, and developed rapidly, the product in 1901 amounting to 7,150,000 pounds, valued at $1,920,000, this being over one-half of the total product of the world.

Stone. Stone suitable for building and other industrial purposes is abundant in almost every State. Because of its bulk and the consequent shipping expenses, its production is largely limited to a comparatively local market. Hence in many of the States which have the most valuable resources of stone the quarrying industry has scarcely more than begun. The utilization of stone varies with the economic condition of the country, the total value having fallen from $53,035,620 in 1889 to $31,346,171 in 1896, and advanced steadily to $55,615,926 in 1901. Limestone is in most common use, only a few States failing to report its production in the latter year, when its aggregate value was $21,747,061. This figure does not include limestone to the value of $4,659,836 used for flux. About $8,204,054 worth of limestone was burned into lime, the bulk of the remainder being used for building purposes, or crushed for road-making. Indiana leads in the quarrying of limestone for building purposes. Granite is second in importance, the value of the product in 1900 being $14,266,104. While its production is also widely distributed, New England yields the largest quantities. Maine leads in its production for building purposes, and Vermont in its production for monumental purposes. The value of sandstone in 1901 was $8,844,974, including bluestone, grindstones, and whetstones. Pennsylvania, Ohio, and New York are the largest producers of these varieties. New York and Vermont produce most of the slate and Vermont and Georgia the bulk of the marble, the value of these two products in 1901 being respectively $4,787,525 and $4,965,699. The value of trap-rock was $1,710,857, about one-half of which was contributed by New Jersey.

Salt. Salt is somewhat broadly distributed as between the East and the West. In 1901 the United States produced 20,566,661 barrels, valued at $6,617,449. Michigan leads and New York follows closely. Kansas is third and Ohio fourth in rank. Nearly 90 per cent. of the total domestic product in 1901 came from these four States. California, Louisiana, and Utah are important producers. The deposits are of various ages. Thus the deposits of New York are of Silurian age, being interstratified with the sedimentary rocks of that time. The salt of Kansas and Louisiana is of Mesozoic or Tertiary age, and that of the Great Salt Lake region is recent.

Cement. The production of Portland cement has a very recent development in the United States. From 335,500 barrels in 1890 the output increased steadily to 12,711,225 barrels in 1901, valued at $12,532,360. Of the total, 67.7 per cent. was reported from Lehigh and Northampton counties, Pa., and Warren County, N. J. The output of natural hydraulic cement in 1901 amounted to 7,084,823 barrels, valued at $3,056,278.

Gypsum. The production of gypsum increased from 256,259 short tons in 1892 to 659,659 short tons in 1901, valued in the latter year at $1,577,493. Michigan is the largest producer, followed by Kansas, Iowa, New York, and Ohio.

Phosphate Rock. The United States is the world's largest producer of phosphate rock. The production of this mineral began in South Carolina in 1867, and reached a maximum output there of 541,645 long tons in 1889, having decreased to 321,181 long tons in 1901. Its production in Florida began in 1888, and has increased almost steadily to 751,996 long tons in 1901. Tennessee, the only other State producing large quantities, began to yield in 1894, and in 1901 it produced 409,653 long tons. The total value in 1901 for all the States was $5,316,403.

Mineral Waters. Almost every State has mineral-water springs from which water is sold annually. The production of the United States increased from 2,000,000 gallons in 1880 to 18,392,732 in 1891, and 55,771,188 gallons in 1901, valued in the last year at $7,586,962. New York, Michigan, and Wisconsin are the largest producers. See section on *Geographical Distribution*, under MINERAL WATERS.

MISCELLANEOUS. A moderate value of asphaltic products is realized each year. These consist of bituminous sandstones, asphaltic limestones, asphaltum, and gilsonite, from California, Kentucky, Indian Territory, Texas, and Utah. Peat is not worked to any important degree, but forms a not inconsiderable reserve of fuel in some Northern States. Slate is extensively produced in Vermont and Pennsylvania. Graphite occurs in the Champlain region of New York, also in Pennsylvania, Georgia, and Alabama. Among other important products are abrasives, borax, pyrite, mineral paints, talc, soapstone, and manganese ore. Almost all the minerals and metals used in the arts are produced, and in quantities sufficient to meet the needs of the home markets. Tin, antimony, platinum, nickel, sulphur, and gems and precious stones are the articles most largely imported.

AGRICULTURE. The United States produces a larger value of agricultural products than any other country. Until the last quarter of the nineteenth century agriculture strongly predominated in the industrial life of the nation. It still employs a much greater number of individuals than any other industry. Owing to the vast area and great variety of physical and climatic conditions, most of the staple products known to the world can be raised. The agricultural development of the United States has had an immense influence on the progress of the world—not only by revolutionizing the system of farm machinery, but by adding to the European food supply and making possible a more rapid growth of population. With respect to the country's adaptability to agriculture, the most prominent features are: First, the preëminence of the Mississippi Valley for agricultural purposes; and, second, the vast waste areas to the west which are but little suited to tillage. If to the arable portion of the Mississippi drainage basin be added the area drained into the Gulf of Mexico by other streams, it would include about one-third of the total area of the United States. In this division, almost unbroken by mountain or swamp area, the soil is generally of great fertility, and probably over four-fifths of the value of the agricultural products may be accredited to this region. The Appalachian and Atlantic seaboard region contains much broken and rocky land, and much soil of only moderate or of inferior quality. Throughout the eastern half of the United States the rainfall is ordinarily sufficient for growth of crops. Westward, however, in the longitude of central Kansas, the rainfall is greatly diminished and the transition from cultivated region to grazing lands is fairly abrupt. The Gulf of Mexico has a decidedly moderating effect on the climate of the Gulf States, particularly Florida. But there is no protection in this region against the cold winds from the north which occasionally sweep southward and bring frosts even to that State. Although much farther south than Southern Europe, the Gulf region is less adapted to the growing of tropical products. The Appalachian Mountains and the Atlantic Ocean together have a somewhat moderating effect upon the Carolina-Virginia region and the region farther north; hence this area has an advantage in the raising of some products, especially fruit, over the region west of the Appalachians. In the north the lakes have a moderating influence, making that territory also favorable for fruit-growing. On the Pacific Coast the ocean breezes and the mountains together afford the most highly protected portion of the United States, and make it unequalled as a fruit region.

AREA OF FARMS AND IMPROVED LAND. In the following table it will be seen that the total farm area of the United States increased in the last half of the nineteenth century nearly threefold:

ACRES OF LAND IN FARMS

CENSUS YEAR	Total	Improved	Unimproved
1850	293,560,614	113,032,614	180,528,000
1860	407,212,538	163,110,720	244,101,818
1870	407,735,041	188,921,099	218,813,942
1880	536,081,835	284,771,042	251,310,793
1890	623,218,619	357,616,755	265,601,864
1900	841,201,546	414,793,191	426,408,355

The total farm area in the decade 1860-1870 stood practically stationary, but the improved area increased during that period. The large gain made between 1890 and 1900 consisted mainly of unimproved land. This was due mainly to the inclusion in the census of large areas of grazing land throughout the West, particularly Texas, in which State the unimproved area increased from 30,660,722 to 106,230,941 acres. In the North Atlantic States the census shows a considerable decrease since 1880 in the improved area, but this was largely due to a change in census methods, and the real decrease was less than indicated. The improved area in the South Atlantic States has increased constantly since 1870. The following table shows the acreage of improved and unimproved land and the total land area in 1900:

STATES BY DIVISIONS	Total land area, square miles	Total improved and unimproved farm area, acres	Improved farm area, acres	Unimproved farm area, acres
North Atlantic	162,103	65,409,089	38,920,614	26,488,475
South Atlantic	268,620	104,297,506	46,100,226	58,197,280
North Central	753,550	317,349,474	222,314,099	95,035,375
South Central	610,215	257,738,845	80,007,867	177,730,978
Western	1,175,742	93,796,860	27,155,681	66,641,179

The most noteworthy fact shown is the great importance, absolutely and proportionately, of the north central division. Over one-half the total farm area in this section is improved. There are but few large regions in the world so easily and uniformly adaptable to cultivation. In Iowa 97.4 per cent. of the total land area was in farms in 1900, and of this 86.5 per cent. was improved. Illinois makes almost an equally good showing, and Indiana, Ohio, and Missouri are other States in this group which have a large percentage of improved land.

Size of Farms. From the following table it will be seen that the size of farms varies greatly in different parts of the country:

Average Number of Acres per Farm by Geographic Divisions.

GEOGRAPHIC DIVISIONS	1900	1890	1880	1870	1860	1850
The United States	146.6	136.5	133.7	153.3	199.2	202.6
North Atlantic	96.5	95.3	97.7	104.3	108.1	112.6
South Atlantic	108.4	133.6	157.4	241.1	352.8	376.4
North Central	144.5	133.4	121.9	123.7	139.7	143.3
South Central	155.4	144.0	150.6	194.4	321.3	291.0
Western	386.1	324.1	312.9	336.4	366.9	649.9
Alaska and Hawaii*	1,142.1	......	......	......	......	......

*No report prior to 1900.

The most fundamental principle in determining the size of the American farm is that it is adapted to an area convenient for the average family. Unlike the English farmer, the typical American farmer does not expect to employ a large number of hands. Neither does he expect to supplement his farm work by hiring himself to others, as is common among the peasant class of France. A son who is a member of a large family often works for a farmer who is not blessed with a surplus of sons, and thus there is an adjustment to suit the average family. The United States, therefore, has no peasant class corresponding to that of Europe. The recent settlement of the West, in which the average homestead (160 acres) was adapted to the average family, has tended to establish this condition of things; but it is also true of the older States. One may note also that in the South, where the plantation system formerly prevailed, a rapid readjustment is taking place to suit the family unit. But the size of farm that a family can cultivate varies with the methods used in cultivation, that is to say, whether capitalistic, intensive, etc. Thus the same labor that will suffice for a grain or stock farm of a given size is sufficient for only one-half or less of that amount when a cotton farm is in question. There are certain kinds of farms that for special causes tend to depart more or less from the system above described. Such are the grazing farms of the West, the Louisiana sugar plantations, the bonanza wheat farms of the Northwest and California, and, in a less degree, the garden farms of the Atlantic Coast, where, though the farms are small, much help is employed. Referring to the foregoing table, in the Western division we have two extremes: large grazing or wheat farms, and small irrigated or fruit farms. In Wyoming less than one-seventh of the total number of farms in 1900 contained less than 100 acres each, while 42 per cent. of the farm land was contained in farms over 1000 acres and the average size for the State was 1333 acres. In Utah the average size of farms was 212.4 acres, and considerably over three-fourths of the total number of farms contained less than 100 acres each. The average given for the North Central States is the most truly representative of the average given for any group. In that division 29.9 per cent. of the farms were between 100 and 175 acres each. The following table shows the relative number of farms in the different-sized groups for three census years:

Percentage of the Number of Farms in each of Seven Specified Areas in Acres—1880-1900.

CENSUS YEAR	Under 10	10 and under 20	20 and under 50	50 and under 100	100 and under 500	500 and under 1,000	1,000 and over
1900	4.7	7.1	21.9	23.8	39.9	1.8	0.8
1890	3.3	5.8	19.8	24.6	44.0	1.8	0.7
1880	3.5	6.3	19.5	25.8	42.3	1.9	0.7

The increase shown in the group 20 to 50 acres was mainly in the Southern States and particularly in the cotton belt of that region. The South Central States had 23.6 per cent. of its farms in this group in 1880 and 30.1 per cent. in 1890. The decrease in the group 50 to 100 acres was mainly in the North Central States, there being at the same time a general increase in this class in the Southern States. The decrease in the group 100 to 500 acres was most marked in the South and West. The two larger groups decreased in the South and increased in the North Central and Western divisions. In 1900 the census made three classifications for farms having between 100 and 500 acres, with the results as follows: Group 100 to 175 acres, 24.8 per cent. of the total farms; group 175 to 260 acres, 8.5 per cent. of the total farms; and group 260 to 500 acres, 6.6 per cent. of the total number of farms. The large number in the group 100 to 175 was partly the effect of the homestead claim laws. Over two-thirds of the farms in Oklahoma were in this group. The decrease in the average size of farms from 1860 to 1880 was due primarily to the rapid decrease in the size of farms in the South. The increase shown in the period 1880 to 1900 was due to the development of large bonanza and grazing farms and to the increased use of machinery.

Farm Tenure. As the country becomes older there is a rapidly increasing and almost universal tendency toward the renting system, though this is much more marked in some regions than in others. In the earlier period of development the man of small means took a claim, but now he is forced to rent. The frontier, as it pushed across the country, has been characterized by the fact that most of its farms were operated by owners. In the table below it will be seen that the highest percentage of owned farms is in the West, but the renting of farms began at once and steadily increased. The increase in tenancy has generally been deprecated as indicating a decadence in agricultural welfare, but in the following table it is shown that the increase in the number of tenants has not been at the expense of owners, for the farms operated by owners have also rapidly increased. In fact, the increase of these tenants since 1850 has been faster than the increase of the agricultural population. The increase in both the number of owners and the number of tenants has been at the expense of the wage-earning employees.

YEAR	Total farms	Number of farms operated by			Number of persons out of each 1000 males engaged in agriculture on farms operated by		
		Owners	Cash tenants	Share tenants	Owners	Tenants	Other persons
1900	5,739,657	3,713,371	752,920	1,273,366	423	231	346
1890	4,564,641	3,269,728	454,659	840,254	420	166	414
1880	4,008,907	2,984,306	322,357	702,244	422	145	433

The first class may be further subdivided as follows: owners, 54.9; part owners, 7.9 per cent.; owners and tenants, 0.9 per cent.; and managers, 1 per cent. There is an increased tendency to delegate the management of farms. In the south especially, the large number of the owners are absentees. Of the total number of owners of rented farms in 1900, 1,005,479 owned but one farm each, 142,838 owned two farms each, 67,719 owned three and under five farms each, 28,698 owned five and under ten farms each, 8966 owned ten and under twenty farms each, 3241 owned twenty farms and over. Of the last group 2332 owners were in the South Central States and 704 in the South Atlantic States. The following table shows the number of owned and rented farms and the tenancy in each class:

YEAR	Total number of farms	Number of farms operated by		
		Owners	Cash tenants	Share tenants
North Atlantic division				
1900	677,506	536,724	66,361	74,421
1890	658,569	537,376	52,120	69,078
1880	696,139	584,847	49,011	62,281
South Atlantic division				
1900	962,225	536,627	172,699	252,899
1890	740,600	461,057	96,098	194,445
1880	644,429	411,673	74,946	157,810
North Central division				
1900	2,196,567	1,583,841	207,732	404,994
1890	1,923,822	1,474,086	147,248	302,488
1880	1,697,968	1,350,225	88,743	259,000
South Central division				
1900	1,658.166	852,620	286,091	519,455
1890	1,086,772	668,972	151,901	265.899
1880	886,648	563,556	105,092	216,000
Western division				
1900	242,908	202,596	18,782	21,530
1890	145,878	128,237	7,292	10,349
1880	82,723	72,005	4,565	7,153

The percentage of rented farms and the rate of increase of these are greatest in the South. The greater proportionate number of rented farms in that section results from the industrial change incident to the overthrow of slavery. Negroes prefer renting to wage-earning. In 1899 there were 769,528 farms operated by colored farmers, of whom 451,799 were in the South Central division of States. Of the latter number 86,748 owned their farms, and 13,895 farms were operated by part owners, 917 by owners and tenants, 623 by managers, 171,105 by cash tenants, and 178,511 by share tenants. It is noteworthy that in the two Southern divisions of States the negro cash tenants almost equal in number the negro share tenants; while at the same time the white share tenants outnumber the white cash tenants 8 to 3. Renting is least customary in the North Atlantic States. (See article NEGRO IN AMERICA, and section on *Cotton* in this article.) Rented farms average less in size than the owned farms, and a larger percentage of the rented farms is improved. This is particularly true in the South and is most noticeable in share-rent farms. Farms in that section are leased mainly for raising crops. Farms in the United States are usually rented for short periods, one year at a time being the most common. In Great Britain, by contrast, the long term system of tenure prevails.

METHODS. See the article AGRICULTURE.

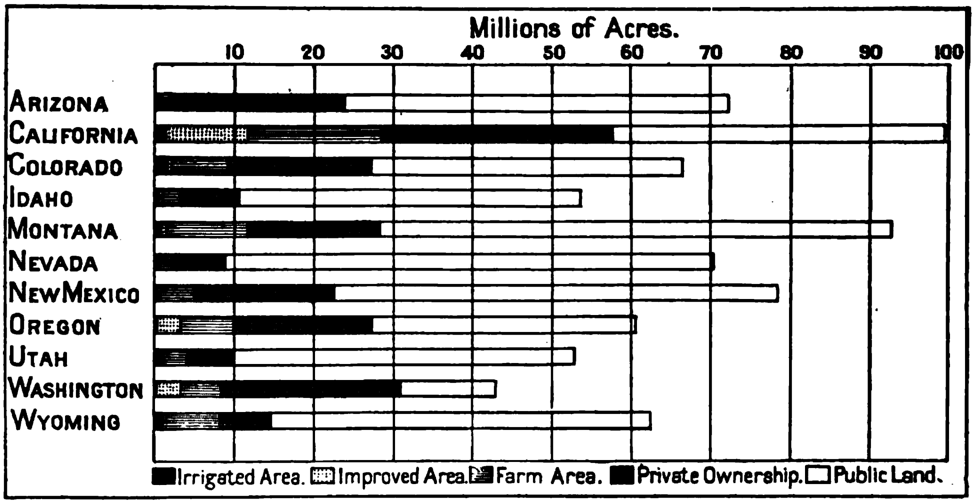
IRRIGATION. It was not until after the humid region had been generally settled that the arid region was occupied. The Mormons, in 1847, were the first to practice irrigation in the West. In 1870 there were only 20,000 acres irrigated. In the Great American Desert the area at present under irrigation and cultivation is insignificant as compared with the uncultivated portion. It is estimated that the water supply is sufficient to irrigate only one-fifth of the arid region.

The decade 1870-80 was characterized by rapid development of small ditches. In the latter year there were about 1,000,000 acres irrigated. The following decade was characterized by rapid construction of canals, nearly all of which resulted financially in failures. In many instances the supply does not equal the demands placed upon the canals. There are now but few unused sources from which water can be largely obtained. Hereafter the extension of the irrigation system will depend mainly upon the construction of large reservoirs. Irrigation has suffered much from the want of adequate laws. In only three States—Colorado, Nebraska, and Wyoming—is the system of supervision and control complete. In several States no public control is exercised. The laws are often indefinite or contradictory. There have arisen disputes as to the rights of the different States to the use of a stream which may pass through their territories. In 1902 a new act was passed by Congress which provided that the Department of the Interior should deal with questions of the water supply, and the location, construction, and management of irrigation works. Receipts from the disposal of public lands are set aside for construction works. Water is to be furnished both to public and private lands. Before the beginning of survey for contemplated works, the Secretary of the Interior is to withdraw from entry, except under homestead laws, any land that may be irrigated from such works. In anticipation of the rise of land values through national irrigation, there was a rush, of speculators who, through a perversion of the intention of the Desert Land Law, the Timber Law, and the commutation clause of the Homestead Law, acquired large areas without actual settlement. The following table shows the status of irrigation in the arid States and Territories:

	NUMBER OF IRRIGATORS		ACREAGE IRRIGATED						Value of irrigated crops, 1899	Cost of construction of irrigation systems
	1899	1889	1899			Total, 1889	In pasture and unmatured crops, 1899	In crops, 1899		
			From streams	From wells	Total					
Arizona	2,981	1,075	184,422	974	185,396	65,821	48,163	137,233	$2,250,519	$4,438,352
California	25,611	13,732	1,293,366	152,506	1,445,872	1,004,233	287,694	1,158,178	32,975,361	19,181,610
Colorado	17,613	9,659	1,604,213	7,058	1,611,271	890,735	311,447	1,299,824	15,100,690	11,758,703
Idaho	8,987	4,323	602,324	244	602,568	217,005	94,385	508,183	5,440,962	5,120,399
Montana	8,043	3,706	951,154	....	951,154	350,582	195,289	755,865	7,281,567	4,683,073
Nevada	1,906	1,167	504,034	134	504,168	224,408	180,816	323,352	2,853,149	1,537,559
New Mexico	7,884	3,085	202,889	1,004	203,893	91,745	21,089	182,804	2,757,107	4,165,312
Oregon	4,636	3,150	388,111	199	388,310	177,944	99,269	289,041	3,062,926	1,843,757
Utah	17,924	9,724	624,186	5,107	629,293	263,473	91,705	537,588	7,462,370	5,865,302
Washington	3,513	1,046	133,698	1,772	135,470	48,799	17,672	117,798	2,361,838	1,722,369
Wyoming	3,721	1,917	605,292	646	605,878	229,676	203,779	402,099	2,886,949	3,973,165
Total	102,819	52,584	7,093,629	169,644	7,263,273	3,564,416	1,551,308	5,711,965	$84,433,438	$64,289,601

California has the largest number of irrigators, but Colorado has the largest irrigated area. The number of irrigators increased faster than the area irrigated, thus showing a tendency to subdivide large irrigated tracts and cut them up into smaller homesteads devoted to fruit-raising. Streams are the principal source of the water supply, although wells are of some importance in California. The value of crops grown on irrigated land is much the greatest in California. In the census year the crops irrigated with their acreage were as follows: Hay and forage, 3,665,654 acres; cereals, 1,399,709 acres; orchard fruits, 251,289 acres; other crops, 226,881 acres.

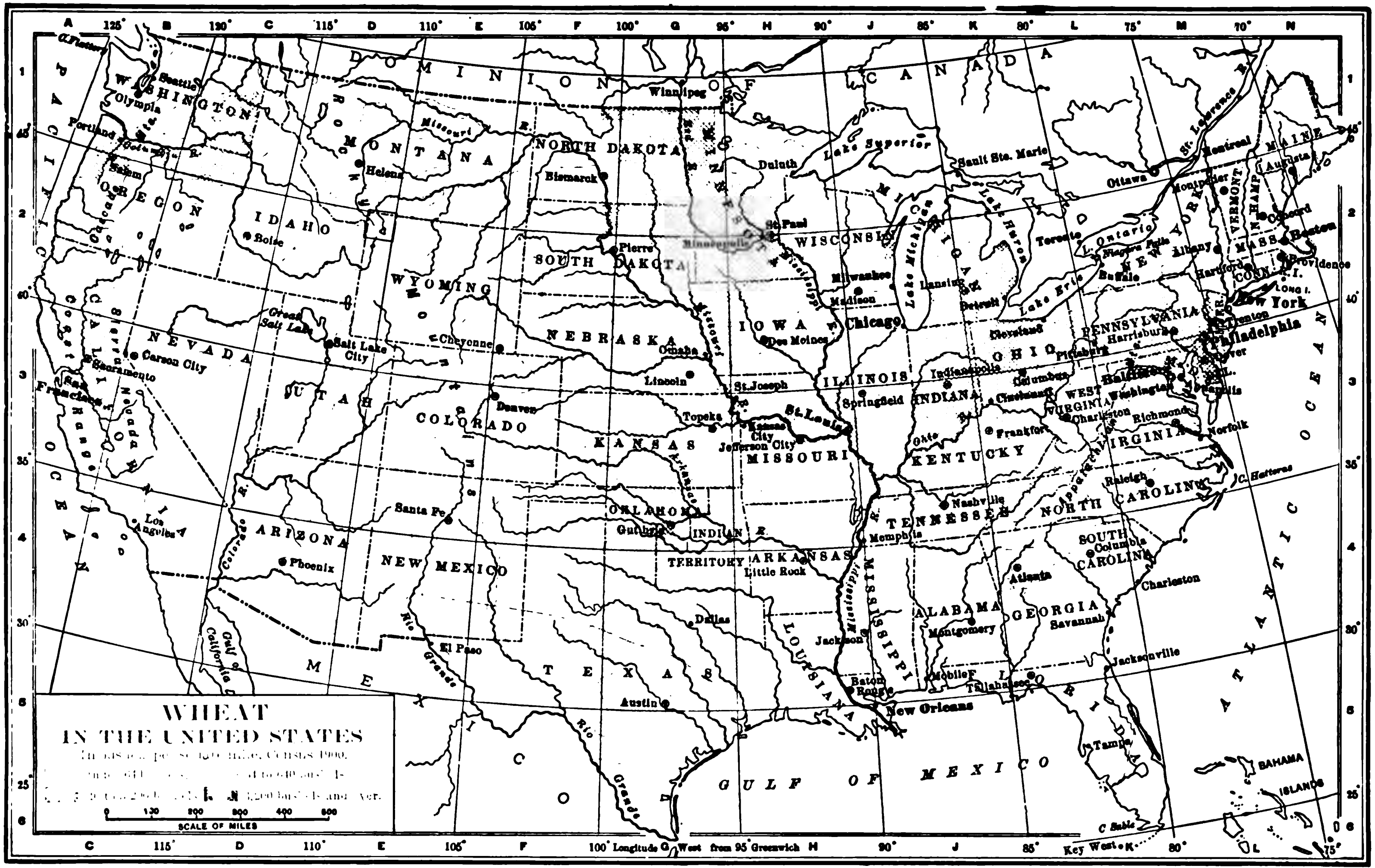
The following diagram shows the relative size of the eleven arid States and Territories, with area in private ownership, farm area, and improved irrigated acreage:



The table on page 661 shows the development and the distribution of the four largest crops. These, together with cotton, are by far the most important crops in the United States, constituting over nine-tenths of the entire crop area.

CORN. The largest and most valuable American crops are corn and hay. They are at the basis of the great stock-raising interests of the country. Since the bulk of both crops are consumed on the farm and not placed upon the market, and hence are not 'money crops,' their importance is usually lost sight of in discussions of American agriculture. Corn stands without a rival either in respect to area or value. It is indigenous to America, and its production is still largely confined to this continent, the United States producing about three-fourths of the world's supply. It is the distinctive American crop. It has a larger acreage than all other cereals combined. See MAIZE.

HAY. As compared with corn, hay is of greater relative importance in regions which are not well adapted for the growing of corn, but where the demand for stock-food is nevertheless great. Thus in the North Atlantic States the acreage of hay is nearly one-third greater than the total area devoted to cereals, and in the Western division of States the acreage of hay is over twenty-nine times that of corn and seven-eighths as great as that of all cereals combined.



WHEAT IN THE UNITED STATES

COPYRIGHT, 1902, BY DODD, MEAD & COMPANY.

	North Atlantic States		South Atlantic States		North Central States		South Central States		Western States	
	Acres	Bushels*	Acres	Bushels*	Acres	Bushels*	Acres	Bushels*	Acres	Bushels*
Corn—										
1900	2,633,120	90,681,350	12,024,742	169,468,960	57,119,558	1,941,220,100	22,894,637	460,250,905	241,616	4,703,055
1880	2,740,199	91,038,700	9,709,842	129,266,107	35,697,248	1,285,284,661	14,062,153	245,520,048	159,062	3,482,160
1850	...	56,629,174	...	125,504,362	...	222,208,502	...	187,338,602	...	390,464
Wheat—										
1900	2,213,587	33,114,070	3,368,872	31,902,857	35,496,201	441,300,918	5,922,170	61,901,477	5,587,744	90,314,930
1880	2,410,758	34,178,947	3,244,860	28,534,367	23,930,197	329,550,755	3,244,321	24,278,499	2,600,197	42,940,519
1850	...	31,181,273	...	20,493,117	...	43,842,037	...	4,436,027	...	533,489
Oats—										
1900	2,792,296	87,273,495	1,268,061	14,874,888	22,196,879	764,279,166	2,328,291	47,407,503	954,171	29,554,323
1880	2,906,929	83,967,199	2,231,526	21,992,934	8,843,653	270,166,435	1,826,491	22,645,208	335,994	10,087,223
1850	...	59,570,301	...	23,294,810	...	42,328,731	...	21,318,218	...	72,119
Hay—										
1900	12,919,041	15,128,311	2,161,201	2,194,115	35,676,042	46,158,805	3,883,662	5,083,325	7,051,123	10,687,006
1880	12,026,364	12,665,694	1,128,420	943,941	15,490,866	19,182,478	633,433	524,414	1,351,971	1,836,184
1850	...	9,471,369	...	752,029	...	3,336,919	...	271,109	...	7,216

*For hay, tons.

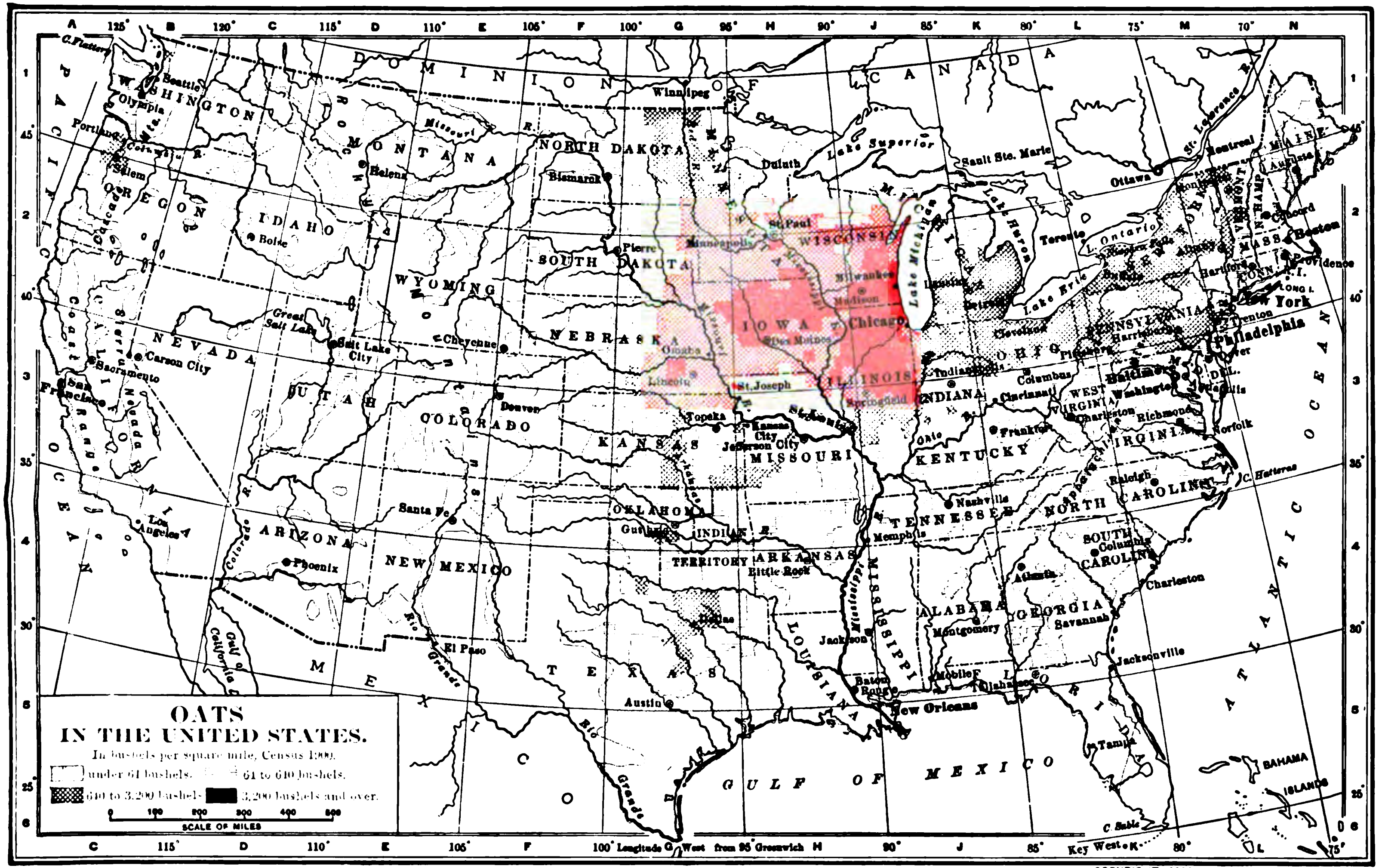
In the latter region a large part of the crop has the advantage of irrigation. In most of the North Central States hay is the second crop in respect to acreage and value. In the cotton States but little attention is given it, although there has been a significant increase in this section in recent years. (See Table.) The increase in the acreage of hay has been especially rapid since 1880, the area devoted to it having doubled between 1880 and 1900, the greatest part of this gain being made in the earlier of the two decades, corresponding to the period in which there was a decadence in wheat culture. The prairie region was easily adaptable to the raising of this crop. Moreover, the increased attention given to cattle and horses, and the need of putting the soil under grass to improve its productivity in the older States, have tended to develop this crop. The principal variety of hay is timothy, its production being confined largely to the North Central and the North Atlantic States. But comparatively little of any other kind is grown in the latter division of States. Next in importance are wild salt and prairie grasses, which are produced in the region in which timothy is little grown—the more arid prairie region and westward. Clover ranks third in acreage, but is a long way removed. Its production is largest in the North Central States. In the Western division of States alfalfa is the most important hay. Two or more crops of this variety of hay are obtained annually, and alfalfa stands first in yield per acre. In the far West, especially California, large quantities of grain are cut green for hay. Millet and forage crops are grown in most parts of the country.

Wheat. There are two other crops which greatly exceed each of the foregoing as money crops, wheat and cotton. The greater part of each of these crops is sold, particularly cotton. They represent also by far the most important exports, and hence are brought to the notice of the public eye in a degree almost out of proportion to their importance. Cotton is the great money crop of the Southern States, and wheat of the North Central and Western States. The United States wheat crop varies in amount from one-third to one-half that of Europe. Wheat can be successfully grown in every State of the Union. However, the competition of certain favored regions has limited its cultivation in others. A hardy crop and of quick growth, it is the principal crop in the far North, and also in the West, wherever the climate is unseasonable for corn. The climate and soil are less favorable to its growth in the South. Wheat, more easily than most other crops, may be handled by machinery, and therefore by capitalistic methods. The existence of level prairie lands, unobstructed by stones or stumps, and purchasable at low figures in large quantities from railroad companies, or, as in California, from the extensive Spanish land grants, explains the rise of the bonanza wheat farms—the most typical of which are found in the valley of the Red River of the North and the Great Valley of California. On some of these farms wheat is cut and threshed in one operation by machines, propelled by steam. In the planting of the grain, also, the highest type of agricultural machinery is used. In some instances steam machinery plows, cultivates, and sows in one operation. These farms are being gradually broken up, and mixed farming is taking their place, as the soil becomes exhausted from the too great repetition of the one crop. During the period from 1870 to 1890 wheat cultivation developed in Argentina, India, and other regions, and these countries came into competition with the United States in the European market. In consequence of this fact there was a decrease in the price of wheat, and in turn in the cultivation of wheat over the greater part of the United States. During the decade 1880-90 there was a decrease in the aggregate wheat acreage of five and two-tenths per cent. But the development of wheat cultivation in the countries mentioned has not been so great since 1890, prices have improved, and wheat culture in the United States has revived, the area devoted to its cultivation having increased fifty-six and six-tenths per cent. in the decade 1890-1900. In the regions where the winters are rigorous, especially where the snowfall is not heavy enough to protect vegetation, as in the Red River Valley, or where the rainfall may be inadequate in the autumn, the wheat crop is sown in the spring. In 1901 a little over four-sevenths of the total wheat acreage was winter wheat. With the development of the Northwest, the raising of spring wheat is rapidly gaining upon winter wheat, having increased from about one-third of the total wheat acreage in 1901. Wheat benefited even more than corn from the improved machinery which came into use about 1850 and subsequently. This, together with the improvement of transportation which made it possible for the product of the interior to reach the European market, and together with the adaptability of the prairie soils to wheat culture, resulted in a more rapid increase in the acreage devoted to it than was true of corn.

Cotton. While the value of the cotton crop is not so great as is that of wheat, the receipts from its sales and especially from its exportation are much greater. (See paragraph on *Commerce.*) There is no other field product which gives employment to so large a number of people. The total area devoted to cotton in the United States increased from 14,480,019 acres in the census year 1880, to 20,175,270 in 1890, and 24,275,101 acres in 1900, the production in bales for those years being respectively 5,755,359, 7,472,511, and 9,534,707. (For detailed tables and map see Cotton.) Through the reduction of the high prices prevailing after the war, the cultivation of cotton is being abandoned almost entirely in the border States. Its area of production is in the region southeast of the Appalachian Mountains, beginning in the north at the southern tier of counties in Virginia, and including over two-thirds of North Carolina and nearly all South Carolina, Georgia, and Alabama, then the region extending north in the Mississippi Valley, embracing western Tennessee, southern Arkansas, Indian Territory, Oklahoma, and the region southward to the Gulf. Florida and the coast plains of the States mentioned are not so favorable for its production as the region farther inland. In recent years there has been a remarkable development of cotton-growing in Texas, Indian Territory, and Oklahoma. Texas now yields twice the amount produced by any other State. Its production in that region, however, has suffered severely from the ravages of the boll-weevil. In 1900 43.80 per cent. of the crop was produced west of the Mississippi River. From the time of the introduction of the cotton gin to the time of the Civil War, the cultivation of cotton was one of the most rapidly developing industries of the United States, being favored by the high prices obtained for its products and the advantages which water transportation afforded in the South to place it upon the market. The most rapidly developing period was 1850-60, when the area devoted to cotton in the ten principal States increased 100 per cent. It was during this period that cotton first asserted its supremacy in the South. The area devoted to corn increased only 17 per cent. in the same period. The construction of railroads and the development of corn-raising in the North Central States made possible the importation of that product, and the cotton-grower believed it more profitable to import his corn and devote his soil to cotton. While corn was well in advance of cotton in acreage at the outbreak of the Civil War, the still higher prices of cotton prevailing after the war turned attention more than ever to it, and subsequent to 1870 the importation of corn became general and the acreage of its cultivation in the cotton States fell below the acreage of cotton. A number of other factors that assisted in strengthening the domination of cotton were operative after the war. The war left Southern planters without capital. In order to secure supplies of food, farm equipments, etc., of the merchant, the farmer was obliged to place his land and his crop under mortgage to the merchant. Cotton was a cash crop, being easily marketed, and was the most acceptable to the merchant, who insisted upon a large production of it in order to make himself safe in case of a partial crop product. Nor did the farmer on his part care to take the risk of experimenting with new or mixed systems of farming. This condition became greatly emphasized by the presence of a large ex-slave population. The negro preferred to become a tenant-cultivator, and as such has become the special prey of the crop-mortgage system. His obligations and his inclinations both tended to restrict him to cotton. Thus, although the price of cotton fell between 1875 and 1900 more than the price of any other crop, rendering its production unprofitable, the economic system which had fastened itself upon the South made it impossible to check cotton cultivation. A vigorously conducted agitation, participated in by the Cotton Trust and by the planters themselves, to reduce the cotton-growing area, had but little result. The utilization of the cotton seed has tended in a measure to offset the consequences of the disastrous fall in the price of the fibre. In 1899 the cotton-seed product amounted to 4,566,100 tons, valued at $46,950,575. The development of manufacturing in the South has tended to enlarge the local markets for all farm products. In some sections this demand for a greater diversity of crops has tended to diminish the dependence upon cotton and the mortgage-holder. But in the greater part of the cotton area proper the tyranny of cotton has scarcely been weakened.

Oats. The only other crop which is grown on a scale comparable with the foregoing crops is oats. The acreage of oats is indeed greater than that of cotton, but the value is much less. It belongs in the group with corn and hay in that it is produced almost wholly for consumption on the farm. More hardy than corn, it is grown as a stock-food substitute for it in the States where corn does not grow well, namely the northern tier of States. In New York, Wisconsin, and some other commonwealths, oats has the largest area of any cereal. In a number of other States it ranks second, including the two largest oats-growing States, Illinois and Iowa, in each of which oats is twice as extensively grown as is wheat. The greatest growth of the industry occurred in the decade 1880-90, when the acreage increased from 16,144,393 to 28,320,677. This increase was associated with the development of the Northern States and the decline of wheat in the region already under cultivation. In New England, the Southern States, and the Far West the crop did not figure prominently. The United States produces less than two-thirds the oats products of the world.

Rice. Although rice was introduced as early as 1700 and has been grown ever since, it was not until near the year 1900 that its cultivation began to assume large proportions. For 150 years its cultivation was confined mainly to the delta lands and tidal rivers of the Carolinas and Georgia, where it was cultivated by the aid of irrigation. It was for a long time the only crop in the United States to which irrigation was applied. South Carolina ranked first in its production until 1880. A new epoch in rice cultivation began in 1897-98, when it was successfully grown by the aid of irrigation in the coastal prairie lands of southwestern Louisiana. The cultivation of rice in that region developed with remarkable rapidity and the production of the coun-



OATS
IN THE UNITED STATES.

COPYRIGHT, 1902, BY DODD, MEAD & COMPANY.

try increased from 115,000,000 pounds in 1898 to 331,000,000 in 1902. Of this last amount, which was only a little short of the consumption of the country, Louisiana and Texas together produced over 90 per cent. In 1900 there were 315,344 acres in rice, of which 201,685 were in Louisiana.

OTHER CEREALS. Other varieties of cereals than those mentioned flourish, but have not become favorites as in some other countries. Barley is rarely grown throughout the greater part of the country. The United States produces only one-ninth of the barley crop of the world and is exceeded by three of the European countries. Barley is most important in California, where it is used as a stock-food substitute for corn. The other States in which it is most grown are Minnesota, Wisconsin, Iowa, and the Dakotas. Its total acreage increased from 1,997,727 in 1880 to 4,470,196 in 1900. Rye, the chief staple in some of the European countries, is wholly unimportant in the United States. Its production is greatest in Wisconsin, Pennsylvania, and other Northern States. Its acreage in 1880 was 1,842,233, and in 1900, 2,054,292 acres. Pennsylvania and New York produce over five-eighths of the total buckwheat for the country, the area devoted to it in 1900 being 807,060 acres. Kaffir corn is found adaptable to the semi-arid regions and is grown most abundantly in western Kansas, Oklahoma, and Texas. There were 19,900 acres of it cultivated in 1900.

VEGETABLES. Almost every American farmer is a gardener to the extent that he endeavors to raise vegetables for family consumption. Gardening on a larger scale than this is determined principally by the question of soil and climate and convenience to market. Market-gardening is therefore a greatly localized industry, and is most common in proximity to the large centres of population. In the census year 1900, New Jersey and Rhode Island devoted over 11 per cent. of their improved land to the cultivation of vegetables, Massachusetts ranking next with 7 per cent. devoted to vegetables. Of the total value of all crops the vegetable product of Rhode Island amounted to thirty-four and nine-tenths per cent., then in order followed New Jersey, Massachusetts, Maine, Florida, Connecticut, Delaware, Maryland, and New York. The value of the vegetable crop in the last named State amounted to 18.1 per cent. The supply of the early market at these centres must be from the South, and hence garden farming has developed extensively at favored points along the Atlantic coast down to Florida, this region not only possessing an advantageous climate and soil, but also cheap water transportation to its markets.

POTATOES. The most extensively grown and most valuable of the vegetables are potatoes, yet the production is small as compared with that of Europe, or even Germany alone. The area devoted to them is greatest in the Northern States; indeed, there is a tendency for them to localize in the northern tier of States. Between 1889 and 1899 the five States, Maine, New York, Michigan, Wisconsin, and Minnesota, increased their area devoted to potatoes 35.9 per cent., whereas in Indiana, Illinois, Kansas, Nebraska, Kentucky, and Tennessee there were decreases ranging from 20.1 per cent. to 26.7 per cent. About one-third of the comparatively small Southern product is shipped North to supply the early market. Of vastly greater importance in the South are sweet potatoes, but these in turn are scarcely raised at all in the extreme Northern States. This crop is the second most important of the vegetables. The total area in Irish potatoes in 1900 was 2,938,778 acres, and in sweet potatoes 537,312 acres.

MISCELLANEOUS VEGETABLES. In recent years there has been an enormous increase in the production of miscellaneous vegetables. This has been partially due to the development of the canning industry, and the consequent greater consumption of vegetables out of their season. This is especially true of sweet corn and tomatoes, the production of which has attained large proportions in some States, Maryland, New Jersey, and New York being in the lead. In 1900 the total value of canned vegetables was $29,368,158, of which over three-quarters consisted of tomatoes and corn. Of other varieties of vegetables the most important are watermelons, which are grown most extensively in the South, Georgia and Texas having the largest acreage. Muskmelons are less restricted as to locality. Cabbages and onions are generally grown, New York leading in their production. The United States contrasts strikingly with Great Britain and some other European countries in that turnips do not figure prominently among the vegetable crops. The census of 1900 reported 2,115,570 acres under miscellaneous vegetables.

FRUITS. The most remarkable development of any phase of American agriculture in the decade 1890-1900 was made in fruit culture. This industry almost doubled in magnitude in that period. The number of orchard trees, for instance, increased from 193,452,588 to 367,164,694 (not including sub-tropical varieties). Most varieties of temperate zone fruits are grown in every State. The use of refrigerator cars has made it possible to transport fruits long distances, and thus all parts of the country have the advantage of the general market. However, climatic differences tend to localize. From the following table it will be seen that the apple has a decided primacy among American fruits:

FRUITS	Trees	
	1890	1900
Apples	120,152,795	201,794,764
Peaches and nectarines	53,885,597	99,919,428
Pears	5,115,055	17,716,184
Plums and prunes	7,078,191	30,780,892
Cherries	5,638,759	11,943,287
Apricots	1,582,191	5,010,139
Total	193,452,588	367,164,694

Although it is grown throughout the country, the apple receives most attention in the North Central group of States and New York, Pennsylvania, and Virginia. The region of greatest development during the years 1890-1900 included Missouri, Illinois, Kansas, and Arkansas. Missouri more than doubled its number of trees, and it is much in advance of all other States. The southwest corner of the State, and the adjacent region of Arkansas and Kansas, have become famous for the production of this fruit. Peaches require a more moderate climate, and consequently are most important in the South. In Georgia and some other Southern States the raising of peaches to supply the early Northern market is a rapidly developing industry. In the North peach culture is developing most rapidly in protected regions, especially along the lake coast region, where the trees are protected from frost by the moderating influence of the Great Lakes. The number of trees in Michigan increased 322 per cent. between 1890 and 1900, and that State took first rank, the centre of peach culture being along lower Lake Michigan. On the Pacific Coast California has become an important peach-growing State. The production of plums and prunes is restricted largely to the Pacific Coast, particularly California. There was the largest increase in this variety of trees of any included in the foregoing list. The United States now produces more prunes than it consumes. Cherries and pears are grown throughout the country. The raising of apricots is mainly restricted to California. Grapes are another crop which require a moderate climate. California is the most favored region for them, and it has over three times more vines than any other State. It is the only State which produces raisins. Besides California, the chief region for the production of wine grapes is the climatically favored Lake Erie region in northern Ohio and western New York.

The production of the three most important varieties of small fruits—strawberries, raspberries, and blackberries—is well extended over the country, but their production in commercial quantities is localized largely in the South, so as to have the advantage of the early market. Cranberries require boggy lands, and are limited to the Cape Cod region, southern New Jersey, and central Wisconsin. Massachusetts has the smallest area, but produces over 60 per cent. of the product. California is unsurpassed as a region for the growing of all kinds of sub-tropical fruits, as the remarkable development of that region during the period 1880-1900 fully demonstrates. While oranges and lemons constitute the chief varieties, olives, figs, and other fruits are included. This region is also the chief centre of almonds and English walnuts. Southern Florida is also a large centre of orange culture and is the only important centre of pineapple culture of continental United States. (For a fuller description of sub-tropical culture, see CALIFORNIA and FLORIDA.) Arizona and New Mexico also give promise of becoming important centres for the growth of sub-tropical plants.

TOBACCO. Virginia maintained the primacy in tobacco production until 1850, when it was surpassed by Kentucky. The latter State has steadily increased, until it represents over twice the acreage and value represented by the former. In the decade 1890-1900 North Carolina more than doubled its acreage and thus advanced ahead of Virginia. In 1900 Kentucky had 384,805 acres; North Carolina, 203,023; Virginia, 184,334; and Tennessee, 71,849. The limestone soil of central Kentucky and of the district northward into Ohio contains potash and other chemical elements required by the tobacco plant, which gives this region special advantage in its production. The principal other States producing tobacco are Wisconsin, Pennsylvania, South Carolina, New York, and Connecticut. The total acreage increased from 695,301 acres in 1890 to 1,101,483 acres in 1900. See map under TOBACCO.

SUGAR AND SUGAR-PRODUCING CROPS. The raising of sugar-cane in the United States proper is largely confined to Louisiana (q.v.). The area devoted to sugar-cane in the United States in 1899 aggregated 386,986 acres. The production of cane sugar in 1899 amounted to over 158,000,000 pounds. The production of sugar-cane molasses in the same year amounted to over 6,213,859 pounds, and of syrup, 12,293,032 gallons. Sorghum cane is grown very generally throughout the United States. The total acreage in 1899 was 293,152, and the syrup produced amounted to 16,972,783 gallons. In the early history of the country a large part of the sugar and syrup consumed was manufactured from the sap of the maple tree. The maple sugar made in 1899 amounted to 11,928,770 pounds, which was but little more than one-third of the product reported in every preceding census year from 1850 to 1890. About two-thirds of this was made in Vermont and New York. The maple-syrup product in the same year amounted to 2,056,611 gallons. Since 1890 there has been a rapid development of the beet-sugar industry. The production of beet sugar increased from 2,203 tons (of 2240 pounds each) in 1889-90 to 195,463 in 1902-03. The latter amount was produced from 175,000 acres of beets. Over two-thirds of this acreage was in Michigan and California, and the remainder was distributed through a number of States. Unlike sugar-cane, the sugar beet is usually grown as an incidental to other farming operations. Owing to their high value per acre, they are both, however, important to the sections in which they are grown.

STOCK-RAISING. Compared with crop-growing, stock-raising is of much more importance in the United States than in European countries. The per capita number of horses, cattle, and hogs is much greater in the United States than in any of the principal European countries. The United States has five times as many hogs, over twice as many cattle, and as many horses as has European Russia, but the latter leads the United States in the number of sheep. Australia and Argentina are the only prominent countries in which the relative importance of domestic animals is greater than in the United States. Of the total value of agricultural products in 1899 more than one-fifth was fed to live stock. In the North Central division one-fourth (in value) of the products was fed to live stock. The following table shows the number and the increase of domestic animals on farms and ranges since 1850:

	1850	1860	1870	1880	1890	1900
Neat cattle	17,778,907	25,620,019	23,820,608	39,675,533	57,648,792	52,489.237
Horses	4,336,719	6,249,174	7,145,370	10,357,488	15,266,244	16,964,799
Mules	559,331	1,151,148	1,125,415	1,812,808	2,251,876	3,039,424
Swine	30,354,213	33,512,867	25,134,569	49,772,670	57,426,859	62,876,108
Sheep	24,000,000	22,471,275	28,477,951	42,192,074	40,876,312	39,937.573

The foregoing figures do not include the young of animals. Furthermore, the census methods of enumeration have not been uniform, and the figures are therefore only approximately comparable. In some instances there has been uncertainty as to whether range animals have been included or excluded. Thus, in the decade 1890-1900 the decrease shown for the number of cattle is thought to be mainly if not wholly apparent, and not real. It will be seen in the table that there has been a much more rapid increase in the number of horses and cattle than of swine and sheep. A comparison with the census figures of population will show that, with the exception of horses and mules, the increase in the numbers of live stock since 1850 has not kept pace with the increase in population. The following table shows the increase in live stock since 1850:

	North Atlantic division	South Atlantic division	North Central division	South Central division	Western division
Total neat cattle—					
1900	5,081,616	3,490,301	23,309,460	13,823,384	6,699,067
1880	5,797,296	3,951,728	15,834,221	9,715,733	4,376,555
1850	4,711,874	4,179,915	4,373,712	4,163,425	349,981
Horses—					
1900	1,641,395	1,014,543	9,070,366	3,175,869	2,050,018
1880	1,554,951	801,239	5,467,031	1,921,393	612,874
1850	1,073,641	770,806	1,398,749	1,056,250	37,273
Mules—					
1900	46,033	545,840	652,360	1,677,607	111,147
1880	38,749	346,944	539,799	836,713	50,603
1850	7,687	153,098	63,256	324,225	11,065
Swine—					
1900	2,322,206	5,562,762	40,474,289	13,047,827	1,460,957
1880	2,521,077	5,720,132	28,118,617	12,212,141	1,200,703
1850	2,670,469	7,497,036	8,536,182	11,609,287	41,239
Sheep—					
1900	2,533,579	1,706,199	10,055,721	3,328,848	22,228,620
1880	4,971,032	2,579,006	13,662,889	6,397,311	14,581,836
1850	7,693,699	2,980,105	7,743,347	2,892,610	413,489

In this table will be observed the great predominance of the North Central division in the number of horses, cattle, and hogs, of sheep in the Western division, and of mules in the Southern. Prior to 1850 the prairie areas west of the Mississippi, and particularly the arid and semi-arid region, including the Cordilleras and a broad belt bounding it on the east, had not been generally utilized. Settlement thus far had been mainly in a wooded region in which there was little natural pasture well adapted to cattle, while swine, being more hardy, could shift for themselves in the forest. The South particularly was much better suited to hogs than to cattle; consequently hogs received much attention west of the Appalachians and in the South. Tennessee, which had the largest number in 1850, had more than the whole North Atlantic division, including as it does New York and Pennsylvania. There was in the latter region much pasture land, and cattle and sheep received considerable attention. As there were no forests to be removed in the West, and the pasture area increased, and the means of transportation opened up the grazing area of the trans-Mississippi region, cattle-raising became of relatively greater and greater importance. The increase in the use of machinery since 1850 has created a larger demand for horses and mules, which, however, has been somewhat checked since 1890 by electric transportation and the bicycle. Mules are increasing much more rapidly than horses in the South. A remarkable fact shown by the table is that in the South Atlantic division there has been, generally speaking, a retrogression in stock-raising. About 1850 cotton began to dominate the agricultural industry, and thus resulted an actual decrease in the number of cattle, swine, and sheep. The same has been true of that portion of the South Central division which was productive in 1850, the increase shown for that division being due to the development of new territory in Texas, Indian Territory, and Oklahoma. A large part of this region is in the grazing and grain belt. Little was done prior to the beginning of the nineteenth century to improve the breeds. By the year 1900 the rate of improvement had become very rapid.

HORSES. The most distinctive success attained in American horse-raising has been in the development of a new and superior breed of race-horses. American racers are now the best in the world. Vermont early became well known for the raising of driving horses, but the Blue-grass region of Kentucky now contains a large number of the most famous breeding farms of driving horses in America. (See article HORSE.) In 1895 there were 120,000 registered standard-bred trotters in the United States. From the trotting stock are bred roadsters and coach horses, the European breed of coach horse not being extensively bred in the country. The United States has not developed any new breeds of draught horses, but imports stock horses of this kind from Europe. The favorite breeds are the English draught, Clydesdale, and Percheron. On the whole, the United States is still far behind Great Britain and some other European countries in respect to the proportion which the number of its thoroughbred horses bears to the total number of horses. Until recently the American farmer was inclined to favor a horse for general purposes, but there is now a decided tendency to breed for special purposes—draught, roadsters, coach, racers, etc. The steady growth in the demand for horses prior to about 1890 resulted in the breeding of the low grade as well as the better class, a condition very much against the improvement of the breed. The decline in demand and depreciation in price between 1890 and 1895 checked the breeding of inferior animals, and since then the grade of horses has improved much faster than before.

CATTLE. The nineteenth century was well advanced before stock cattle from Europe had been imported to any considerable extent. Shorthorns were for several years imported in the largest numbers, and there are more pure-blooded and grade shorthorns in the United States to-day than all other breeds. The 'hustling' qualities of the Herefords made them favorites in the range States. The polled Angus were introduced later (1870), but have become rivals of the Herefords for beef purposes, especially in the North Central States. These three breeds comprise practically all the pure-blooded cattle in the United States used for breeding and for grading up native cattle for beef purposes. In feeding and breeding beef cattle it has been the aim in recent years to reduce the time necessary to prepare the animal for market. In the Western and South Central States the average age of range cattle decreased six months from 1890 to 1900. It was claimed that in the latter year cattle matured a year earlier than in 1880. Pure-blood bulls are most common in the range States of the West.

The method of cattle-raising in the range region has greatly changed in the last quarter of the nineteenth century. Formerly cattle were pastured and driven about without hindrance over Government lands. To-day much of the range area is inclosed by wire fences. Part of the former range area has been settled by small farmers, but produces more cattle than under the old system. Instead of letting range cattle shift for themselves in winter, as formerly, it is common to provide food and protection for them.

The recent remarkable development in the dairying industry has exercised a decided influence over cattle-raising. The number of milk or dairy cows increased from 6,385,000 in 1850 to 17,139,674 in 1900, while the increase in dairy value of these cattle was proportionately much greater. See CATTLE, and DAIRYING.

HOGS. The United States has accomplished more in the development of new and superior breeds of hogs than in that of any other farm animal. Indeed, in both the quality of the breed and in absolute number the United States stands almost alone in this branch of industry. In 1900 the United States had as many hogs as the entire Continent of Europe.

The hog is the largest consumer of American corn, and where there is an abundance of one there are large holdings of the other. The hog is ready for the market at an early age, and is therefore a 'quick-money' animal. If it can be saved from disease it is the most profitable investment for the corn-grower. It has won the appellation of 'mortgage-lifter.' Until toward 1850 the most common grade was the half-wild, long-legged, thin animals known as 'razor-backs.' They are still common in the Southern States, but before 1830 a distinct breed, the Chester White, had been developed in Chester County, Pennsylvania, and about 1840 another new breed, the Poland China, originated in southwestern Ohio. The Durocs or Jersey Reds, another native breed, first became common in New Jersey, and is now well known over the country. Through these and other improved native breeds, together with the imported Berkshires, the grade of hogs in the North Central States has been improved until it has reached a very high standard. Stockmen have aimed at securing a breed that will fatten quickly and at an early age. The Poland China satisfies this condition, and its imprint is most noticeable among American hogs.

SHEEP. Sheep hold a much lower rank in the agricultural economy of the United States than in that of most modern nations. The industry has labored under the disadvantages of a vacillating tariff policy, and for a number of years has had to compete with the growing flocks of Australasia and of the Plata region of South America. In the United States the number of sheep increased from 28,477,591 in 1870 to 50,626,626 in 1884, after which year there was a rapid decrease in numbers. During the middle of the nineteenth century the merino was the prevailing breed, and in 1870 more than four-fifths of all the sheep in the United States were either pure breed or grade merino. In 1900 it is estimated that 30 per cent. of the flocks in the range country were of mutton breeds, and that from seventy to eighty per cent. of those in the farming States had a predominance of English blood. The merino blood still predominates in the range States. In consequence of this change the average value of sheep nearly doubled between 1870 and 1900. The average weight of the fleece increased from 4.8 pounds in 1880 to 5.6 pounds in 1890 and 6.7 in 1900. Thus, although the number of sheep decreased, there was a large gain in the total wool production, amounting to 16.8 per cent. in the decade 1890-1900. The number of sheep in the United States in 1900, outside of the Western division of States, was not so great as in 1850. Sheep-grazing began to spread rapidly in the Western division about 1870. Since 1890 there has been most remarkable development in sheep-grazing in the northern Cordilleran States. In Montana, the foremost sheep State in the Union (4,215,000 head in 1900), the increase amounted to 79.2 per cent.; in Wyoming, which ranks third, the increase amounted to 367 per cent.; while in Idaho it was 449.5 per cent. In New England the dairy industry has supplanted sheep-raising, so that the number of sheep in 1900 was less than one-third the number in 1850. Since 1880 there has been a decline in the North Central States, particularly Ohio. Texas in 1890 had attained first rank, but in 1900 had only one-third the number of sheep reported for the earlier year. Elsewhere through the Southern States the industry was never important, and has declined generally since 1850.

POULTRY. The importance of the production of eggs and poultry in the United States is not generally realized. The value of the poultry and the egg products in 1899—$136,891,877 and $144,286,370 respectively—was two-thirds greater than the value of wool and about one-fourth greater than that of oats produced in that year. The egg production (chicken) for the year amounted to 1,293,818,144 dozen, an increase of 474,000,000 dozen over 1889. This gain was partly due to the greater use of the incubator. The value of the egg product in Ohio and Iowa in 1899 each exceeded $10,000,000. The different kinds of fowls in 1900 numbered as follows: Chickens, 233,598,005; turkeys, 6,599,367; geese, 5,676,863; and ducks, 4,807,358. The foregoing figures are for farms, not villages, and do not include fowls under three months old.

FORESTS AND FOREST PRODUCTS. See the articles on FORESTRY and LUMBER INDUSTRY.

MANUFACTURES. The United States is the foremost manufacturing country in the world. The net value of its manufactured products in 1900 was nearly double that assigned by Mr. Mulhall to the manufactured products of Great Britain in 1894; and, according to the United States census estimate, was considerably over a third greater than the value of the British products in 1900. In the United States nearly 1,000,000 more persons were employed in 1900 in manufactories than were similarly employed in 1899 in Great Britain. Mr. Mulhall also estimated that if the extra value of United States products due to a protective tariff be included, the United States produced about one-third of the total manufactures of all nations. He claimed further that American manufactures multiplied twenty-fold between 1840 and 1894, while those of Europe only doubled. Manufacturing is absolutely the most rapidly growing of the American industries, and has become of coördinate importance with, if not of greater importance than either of the two other leading American industries—agriculture and trade and transportation.

The net value of the products of manufacture in 1900 was more than double the value of the net products of the farm. Even after the crude materials contributed by the farm, the forest, the mine, and the sea have been eliminated from the total net value of manufactured products, the value remaining still exceeds by more than one-sixth the net value of agricultural products. The value of manufactured products was twelve times as great in 1900 as in 1850, whereas the value of agricultural products was only three times as great. The number of individuals engaged in manufacturing was nearly a fourth less than the number in agriculture and over one-fourth greater than the number engaged in trade and transportation. See paragraph on *Occupations* in section on *Population*.

NATURAL ADVANTAGES. There is nothing strange in the large proportions which the manufacturing industry is attaining. There is no other territory under one government in the world with so much productive power. The abundance of raw material required by the manufacturing industries, the degree of availability, including transportation facilities, and the capabilities of the producers are unequaled. Both food supplies and agricultural materials for manufacture are cheaper, more abundant, and more varied in the United States than in any other manufacturing country. The well-distributed forests contain most varieties of timber needed in large quantities, and in amounts that admit of heavy exportations. The mineral resources also include nearly every variety required for manufacturing industries. In the production of the two minerals which constitute the basis of modern manufactures, coal and iron, the United States ranks foremost, and, indeed, produces nearly a third of the world's output of each. Moreover, the deposits of these minerals, together with deposits of limestone, which is needed in fluxing the iron ore, are frequently found in the same locality.

The transportation facilities include 18,000 miles of navigable rivers and a railway mileage that is greater than that of all Europe and that is over 39 per cent. of the railroad mileage of the world. The competition of the waterways with the railways gives the country the advantage of cheap rates. Another advantage about which little is said, but which, nevertheless, is great, is the freedom of interstate commerce. In no other equally large area in the civilized world is trade unrestricted by customs, excises, or national prejudice. The freedom which the United States enjoys from tradition is another factor of prime importance. At the same time the manufacturing industry has profited by reason of the contribution of ideas of people schooled under different industrial systems. The immigrant, like the native-born, is animated by the prospects of large possibilities, and a greater energy and ingenuity pervades industrial society in the United States than is known in the European countries. As a result the individual laborer accomplishes more in this country than he does abroad.

Mulhall says that nearly all American manufactures are produced by machinery, while in Europe more than one-half is hand work. With respect to the completeness of organization, the minuteness of its subdivision, and the rapidity with which work is expedited, the United States also excels. The United States has developed a system of 'interchangeable mechanism' which has proved of inestimable value to the progress of the manufacturing industry.

LOCALIZATION. The manufacturing industry is very unevenly distributed over the country. There is a decided tendency to centralize in limited localities. The greater part of the manufacturing is carried on in the region north of the Potomac and Ohio rivers and east of the Mississippi. The centre of manufactures has always been well to the north and east of the centre of population, but has at every decade moved westward, and was nearer the centre of population in 1900 than in 1850. In 1850 the New England States produced 27.8 per cent. of the total products of the United States, and the Middle States 46.4 per cent. Notwithstanding the great increase in both sections, their relative production had decreased respectively to 14.4 and 38.0 in 1900. About 1850 the Central States were occupied chiefly with agricultural pursuits, and produced only 14.3 per cent. of the total product. But nowhere else in the world has there been so rapid a transformation of the occupations of the population. In 1900 that section produced 30.7 per cent of the total product. The Southern States suffered greatly in consequence of the Civil War, the per cent. of the total product contributed by that section having fallen from 10.3 in 1860 to 6.6 in 1870. Since 1870, however, there has been a rapid revival of industry, and in 1900 it produced 9.1 per cent. of the total product of the country.

In the localization of industries the factor of transportation in its relation to the supply of raw materials and the market has been one of primary importance. This applies especially to bulky and heavy products which are shipped with difficulty. Thus Pennsylvania and eastern Ohio become the iron-manufacturing region, since coal and iron are brought together here at a minimum cost. Live animals cannot be so easily shipped as packed meats, and hence the slaughtering industry is confined mainly to the West. The saving in the cost of transportation is a chief reason for the recent development of cotton manufacturing in the cotton-growing region. Proximity to the supply of wood and iron, and convenience to the market, give the Lake States the advantage of manufacturing agricultural implements at a minimum transportation cost. The densely populated Atlantic Coast region from Baltimore to Maine enables manufactures located in that section to reach a large market with a minimum transportation cost.

Another important natural condition affecting localization of industries is water power. This was formerly more important than at present, and is more prominent in determining the exact spot than the general section. Often, however, the natural advantages mentioned are of secondary importance, or decline in relative importance after an industry is well established. In such cases the momentum which an industry has received by its early start is often sufficient to carry it on. After long-continued success at a given point a certain precedence may become attached to the name of the place and a fostering local atmosphere is developed. In many industries technical training is of greater importance than accessibility to raw materials. Abundance of capital and labor are other prominent advantages. The North Atlantic States have benefited greatly from each of the three advantages just mentioned. Agriculture in this section long since ceased to absorb the available local capital, or afford an occupation for the surplus labor. For the growth and extent of manufactures, see MANUFACTURES, and the separate articles on the various manufacturing industries, such as COTTON; IRON AND STEEL, METALLURGY OF; WOOL; etc. Also see the paragraph on *Manufactures* under the various States, and see FLOUR.

TEXTILES. The group of industries called textile in 1900 ranked first in the number of wage-earners employed, second in the amount of capital invested, and third in the value of products. If allowance be made for duplications, the value of products given in the table of the 15 groups of industries would be reduced to $1,095,127,934—the net value of products ready for direct consumption. The following table shows the growth of the combined textile industry since 1850 and its importance in 1900:

INDUSTRIES	Year	Number of establishments	Capital	Wage-earners; average No.	Value of products
Combined textiles	1900	4,312	$1,042,997,577	661,451	$931,494,566
Cotton manufacture:					
Cotton goods	1900	973	460,842,722	297,929	332,806,156
Cotton small wares	1900	82	6,397,385	4,932	6,394,164
Wool manufacture	1900	1,414	310,179,749	159,108	296,990,484
Silk manufacture	1900	483	81,082,201	65,416	107,256,258
Hosiery and knit goods	1900	921	81,860,604	83,387	95,482,566
Flax, hemp, and jute	1900	141	41,991,762	20,908	47,601,607
Dyeing and finishing textiles	1900	298	60,643,104	29,776	44,963,331
Combined textiles	1890	4,276	767,705,310	517,237	759,262,283
Combined textiles	1880	4,018	412,721,496	384,251	532,673,488
Combined textiles	1870	4,790	297,694,243	274,943	520,386,764
Combined textiles	1860	3,027	150,080,852	194,082	214,740,614
Combined textiles	1850	3,025	112,513,947	146,877	128,769,971

The inflation of the currency for 1870 makes the money figures for that year too large, and the increase in the following decade seems too small. It will be seen that, omitting flax, hemp, and jute, the capital invested has multiplied more than 8 times in 50 years and that the value of products has increased almost seven-fold. The much less relative increase of wage-earners (336.1 per cent.) indicates the growing importance of machinery in the manufacture of textiles.

The cotton-manufacturing industry has developed in recent years with great rapidity, and has placed the United States first with respect to the number of bales of cotton consumed. According to one estimate the average number of bales consumed for the five years ending with 1870 was 875,000 for the United States, 1,842,000 for the Continent of Europe, and 2,639,000 for Great Britain. The consumption for the year 1900 was respectively 4,599,000, 5,720,000, and 4,079,000 bales. However, when it is considered that the greater part of the spinning in the United States is of coarse or medium yarns, whereas the average spinning on the other side of the Atlantic is much finer, and the estimate is based upon the number of spindles or persons employed, it will be found that Great Britain is far in the lead. In 1900 the United States had 19,008,000 spindles, the Continent of Europe 33,000,000, and Great Britain 46,000,000. The data for the comparison of woolen manufacture in the different countries is less satisfactory. An estimate of wool consumption for 1894 accredited North America with 458,000,000 pounds, the Continent of Europe 1,247,000,000 pounds, and Great Britain 507,000,000 pounds. The United States exceeds but slightly, if at all, any of the three leading Continental woolen manufacturing countries—France, Germany, and Austria. The recent rapid development of silk manufacturing has placed the United States second in rank, and of the total product of the United States and Europe the former produced in 1900 23.3 per cent. The manufacture of flax, hemp, and jute in the United States is comparatively small.

WOOL MANUFACTURES. The greater part of the manufactures of wool consumed in the United States is of domestic production, the imports of woolen goods ranging in value from one-twenty-fifth to one-sixth of the value of the domestic production. The bulk of the wool used in manufacture is domestic, but the imports of raw wool also fluctuate enormously. The percentages of imports to the supply for the years 1896-1900 inclusive were respectively 46.3, 58.0, 20.9, 22.2, and 29.4. The total amount imported during that period was about two and one-half times the amount imported from 1881 to 1885 inclusive. Wool manufactures may be grouped under the general heads of woolen goods, worsteds, carpets (other than rag), felt goods, and wool hats. Until very recently the first of these groups had comprehended the greater part of the industry. There has been, however, a decline in the value of the products of woolen goods from $160,606,721 in 1880 to $118,430,158 in 1900. In the latter year there were 68,893 wage-earners employed in 1035 establishments. The decline in the manufacture of woolen goods is due to the introduction of worsted cloth for men's wear and the development of knit-goods manufacture. The change from one to the other was incident upon the mechanical improvements which made possible the combing of short staple wool and to the adaptation of American wools to the combing process consequent upon the crossing of the merino sheep with those of English blood. See AGRICULTURE.

The manufacture of worsteds began in 1843. The progress has been rapid and steady, the value of the product in 1900, $120,314,344, being in excess of the value of woolen goods for the same year. There were 57,008 persons engaged as wage-earners in the industry. The first carpet manufactory was opened in 1791. The power loom was adapted to the weaving of ingrain carpets in 1844, and later to the weaving of Jacquard Brussels, Wilton, tapestry Brussels, and other makes. In 1900 28,411 persons were engaged as wage-earners in the industry and the product was valued at $48,192,351. The value of felt goods in 1900 was $6,461,691, and wool hats, $3,591,940. The woolen industry is almost wholly confined to the New England and the Middle Atlantic States, Massachusetts and Pennsylvania together producing over half the total product. Pennsylvania—chiefly Philadelphia—produces 48 per cent. of the carpet product of the United States. The following table shows the number of spindles employed in wool manufactures:

COMPARATIVE STATEMENT OF SPINDLES, 1890 AND 1900

	Woolen		Worsted		Cotton	
	1900	1890	1900	1890	1900	1890
Woolen mills	1,789,683	1,742,288	65,762	19,750	51,136	53,342
Worsted mills	150,026	207,180	1,125,644	479,675	95,356	68,225
Carpet mills	67,033	53,046	133,849	151,132	8,324	4,680
Felt mills	24,286	13,829	....	....	....	....
Total	2,031,028	2,016,343	1,325,255	650,557	154,816	126,247

HOSIERY AND KNIT GOODS. The hosiery and knit goods products were formerly classed with the woolen goods, but since cotton has become the chief material used they have been separately classified. The industry is of recent development and has almost equaled the worsted and the silk industry in rapidity of growth. In 1850 the product was valued at only $1,028,102; in 1900 it was over 90 times that value. In the latter year 83,387 persons were engaged as wage-earners in the industry. New York and Pennsylvania produced about four-sevenths of the total product.

SILK MANUFACTURES. In 1850 the value of silk manufactured in the United States was $1,809,476. In 1900 it was 60 times that amount, and the amount of raw silk consumed exceeded that consumed in France, the largest European manufacturer of silk. There were 483 establishments, employing 65,416 wage-earners. Almost the entire supply of raw silk used in the census year, 9,760,770 pounds, was imported from Japan, China, and Italy. The principal silk manufacturing district is northern New Jersey, after which come Pennsylvania, New York, and Connecticut.

FLAX, HEMP, AND JUTE MANUFACTURES. The value of the flax, hemp, and jute products increased from $37,313,021 in 1890 to $47,601,607 in 1900. In the latter year there were 20,903 wage-earners employed in 141 establishments. Binder twine and rope together constitute about five-ninths of the total product. Hemp is the principal material used. Very little success has attended the spasmodic attempts to establish linen manufactures in the United States. The flax grown here is not suitable for spinning. Massachusetts, New York, and Pennsylvania are the chief manufacturing States in this line.

CLOTHING. The production of men's ready-made or 'factory-made' clothing was already well advanced by 1850, but the manufacture of women's ready-made clothing has developed almost wholly since then. The total value of men's clothing—factory product—in 1900 was $276,861,607, an increase of 10.3 per cent. between 1890 and 1900, a decrease in price having made this figure much smaller than it would have been on the old scale of prices. The value of women's factory-made clothing meanwhile increased 133.8 per cent., the value in 1900 being $159,339,539. There are few other important branches of industry that employ so many wage-earners in proportion to the value of the product. In 1900 there were 120,950 engaged in the manufacture of men's clothing, and 83,739 in that of women's clothing. Since about 1876, however, there has been a revolution in the system of manufacturing men's clothing, resulting from the greater division of labor and the use of machinery, so that there has been a decrease of nearly one-fourth in the number of wage-earners.

Prior to about 1876 ready-made clothing was made principally by skilled tailors, assisted by members of their household. About that time the 'team-work' and task-price system was introduced, which divided the work between a number of persons. Each person performs only a small detail of the work, and little or no skill is required. Since the work requires no previous experience and no knowledge of the language, the unskilled foreign element in the large population centres have naturally drifted into it. The manufacturer, after the cloth and the linings have been cut, usually lets the work to contractors, who sublet it to be done in private houses or small workshops. This 'sweating system,' so called, represents one of the most unsatisfactory labor conditions in America. Very recently a new system, called in contradistinction the 'factory' system, is supplanting the task system. More persons are employed in a shop, and sometimes more than 100 persons are engaged in the making of one coat. More skill is required in the manufacture of women's clothing, and the task system has not been applied much in cloak manufacture. Considerably over one-third of the total product of men's ready-made clothing and over two-thirds of women's ready-made clothing are made in New York City. The increase in the value of men's ready-made clothing between 1890 and 1900 was greater for New York State than for the whole country. The business formerly done in Massachusetts has been largely transferred to New York.

The value of the clothing product of men's custom work and repairing for 1900 was estimated at $137,714,282, and of women's custom-made clothing and dressmaking, $48,356,034. Other important items of clothing manufacture for the same year were: Shirts, $49,022,845; men's furnishing goods, $43,902,162; and hats and caps, $52,797,697.

Iron and Steel. The United States is abundantly provided by nature with resources that are necessary for the production of iron and its manufacture. (See Mining.) No other industry compares with it in the absolute growth made since 1880. In 1890 the United States led the world in the production of pig iron and steel, and in 1900 its production of pig iron was 46 per cent. greater than that of Great Britain and its production of steel was more than twice as great as that of the rival country. In 1902 the United States produced 15,000,000 tons of steel out of a total world product of 35,000,000. Next to the United States were Germany, with 7,780,000 tons, and Great Britain, with 5,000,000 tons. The following table shows the growth since 1880 of the total iron and steel industry and of its three fundamental divisions: pig iron; steel ingots, steel castings, and rolled iron and steel; and iron blooms, billets, and hammered bar iron:

	Year	No. establishments.	Capital	Average number wage-earners	Tons product	Value product
Iron and steel total	1900	669	$590,530,484	222,607	29,507,860	$804,034,918
	1890	719	414,044,844	171,181	16,264,478	478,687,519
	1880	792	209,904,965	140,798	6,486,733	296,557,685
Pig iron	1900	224	148,226,113	39,358	14,452,234	206,823,202
	1890	304	134,604,543	33,415	8,845,185	145,643,153
	1880	341	89,531,362	41,695	3,375,912	89,315,569
Steel ingots and steel castings and rolled iron and steel	1900	438	441,795,983	183,023	15,040,129	596,689,284
	1890	395	278,559,831	137,295	7,388,244	331,860,872
	1880	358	116,458,390	96,164	3,046,038	203,274,042
Iron blooms and hammered bar iron	1900	7	508,388	226	15,497	522,432
	1890	20	876,470	471	31,049	1,183,494
	1880	93	3,915,213	2,939	64,783	3,968,074

Coke is the principal fuel used in blast furnaces, while bituminous coal and slack are the most important fuel used in the rolling mills and steel works. There has been a great decrease since 1880 in the number of furnaces using charcoal for fuel and also in the number using anthracite alone and mixed anthracite and coke, but an increase in the number using coke or bituminous coal and coke, the latter class numbering 235 in 1900. The production of Bessemer pig iron in the census year amounted to 8,475,530 tons, while that produced by the basic open-hearth method amounted to 937,439 tons. Blast-furnace stacks decreased from 681 in 1880 to 399 in 1900, of which 326 were active. The value of iron rails manufactured decreased from $20,974,697 in 1880 to $31,180 in 1900. The value of steel rails manufactured, on the contrary, increased from $37,892,075 in 1880 to $60,272,575 in 1890, and then decreased to $46,501,979 in 1900, this decrease being due to a fall in price, there having been a large gain in tonnage. The value of iron and steel bars and rods, not including sheet or tin plate bars or wire rods, increased from $56,696,679 in 1880 to $100,597,221 in 1900. Other large items of manufacture in 1900 were iron and steel wire rods, $35,529,529; iron and steel hoops, bands, cotton ties, and skelp, $49,159,747; iron and steel boilers and other plates and sheets, except nail and tack plate, black plates, or sheet for tinning and armor plate, $68,109,223; iron and steel roll blooms, slabs, billets, tin plate bars, and sheet bars, $96,321,887. The following table shows the growth of the industry for the three leading States:

STATE	Year	Number establishments	Capital	Wage-earners, average number	Value of products
Pennsylvania	1900	291	$321,985,659	110,864	$434,445,200
	1890	311	226,294,407	92,473	264,571,624
	1880	321	102,956,223	57,952	145,576,268
Ohio	1900	107	86,477,552	33,677	138,935,256
	1890	101	37,642,887	23,546	65,206,828
	1880	103	22,807,606	20,071	34,918,360
Illinois	1900	26	43,356,239	16,642	60,303,144
	1890	24	34,689,919	8,685	39,011,051
	1880	16	5,795,620	5,253	20,545,289

See the articles Iron and Steel, Metallurgy of; and Pennsylvania.

Electric Apparatus and Supplies. There is no industry of so recent development that has attained the magnitude of the electrical apparatus and supply manufacturing business. The total product was valued at only $2,655,036 in 1880, and increased to $91,348,889 in 1900. In the latter year the industry employed 40,890 wage-earners, in 580 establishments. The product comprehended a great variety of things, the most important of which were motors, valued at $19,505,504; dynamos, $10,472,576; and telephones, $10,512,412. The industry centres mainly in a few of the largest cities.

Shipbuilding. Shipbuilding was, after agriculture, the first industry to develop in colonial America. The possession of an abundance of timber has always given the United States a great advantage in the building of wooden vessels. Vessels constructed in the United States carried the bulk of the American trade until after 1860. The zenith of the shipbuilding industry was reached between 1850 and 1860, at which time the superiority of the American-built 'clippers' for endurance, speed, and safety was conceded. About the time of the Civil War, which was in itself a serious blow to the industry, the British shipbuilders were changing from sail to steam and from wood to iron in the construction of vessels, neither of which changes was adopted by the American builders. In consequence American shipbuilding failed to hold its own absolutely, and relatively fell far behind foreign countries. For many years American shipyards have done little more than supply vessels for the large domestic water-borne trade, which has by law been restricted to vessels built in the United States. The aggregate tonnage of American-built vessels registered for the foreign trade in 1900 amounted to only 42.2 per cent. of the total product turned out by American shipyards for that year. Only one steel steam vessel was built in the United States during 1900 for the foreign trade. The figures for the construction of iron and steel vessels have been greatly swollen in recent years in meeting the requirements of the Navy Department. The order for warships has been placed with domestic firms, in the belief that it would lead to the equipment of plants in a way that would enable them successfully to engage in the construction of large steel merchant vessels. The value of products for the private iron and steel shipbuilding establishments increased 287 per cent. between 1890 and 1900, but there was a decrease of 3.4 per cent. in the value of products for wooden ship and boat building during the same period. Sixteen and two-tenths per cent. of the total tonnage built in the United States during that year was constructed on the Great Lakes. The Delaware River district is far in the lead in the shipbuilding industry. The Chesapeake Bay is also important. These two regions employ nearly one-half the capital invested in the industry in the United States.

Cars—Steam Railroad. The manufacture of cars has developed rapidly to meet the demands of the growing railroad traffic. According to the census of 1900, 1296 establishments came under the class "cars and general shop construction, and repairs by steam railroad companies," with 173,652 wage-earners employed, and products aggregating a value of $218,238,277. Under the heading "cars, steam railroad, not including operations of railroad companies," there were 65 establishments, employing 33,453 wage-earners, and having a product valued at $90,510,180. Between 1890 and 1900 the value of the products of the former class increased 68.6 per cent. and of the latter 29.1 per cent. The industry, particularly the former class, is widely distributed over the country, but is of greatest importance in the region of heaviest railroad traffic, or where supplies of lumber and iron are most convenient. Pennsylvania is far in the lead, with New York and Illinois following, although Indiana reported the largest value of products for car companies not including railroad companies. In recent years there has been a marked increase in the weight, strength, size, and convenience of cars. (See paragraph *Railroads.*) Steel is now extensively used to replace or to strengthen wood in car construction. A steel car company of Pittsburg uses over 1600 tons of steel a day, and is the largest single consumer of steel in the world.

Locomotives. During the census year 1900 there were 28 establishments solely or chiefly manufacturing locomotives. At these works 2774 locomotives were built, representing an aggregate value of $27,121,063—an increase in number of 15.2 per cent., and in value of 37.3 per cent. over 1890. In addition, 272 locomotives, valued at $3,276,393, were constructed at 26 railroad repair shops. There is a constant increase in the size, weight, and steam-generating capacity of locomotives constructed. Over one-half of the total number are built in Pennsylvania, Philadelphia having the largest locomotive works in the world. About half of the remainder are manufactured in New York. Since 1894 there has been a rapidly increasing number of locomotives exported (525 in 1900), quickness of delivery, efficiency, and price all being in favor of the American locomotive. The manufacture of traction engines and of motor vehicles has become very important. In 1900, 6132 of the former and 4192 of the latter were manufactured.

Carriages and Wagons. The manufacture of carriages and wagons exceeds in value of products the manufacture of agricultural implements. In the early part of the nineteenth century transportation was still mainly by horseback, and the value of the carriages and wagons manufactured in 1810 was only $1,421,573. In 1900 the corresponding figure had grown to $121,537,276, and the capital invested was nearly as great. There were in that year 7,632 establishments, employing 62,540 wage-earners. In recent years three factors have tended to limit the use and consequently the manufacture of carriages, namely, the bicycle, the electric railway, and the automobile. Ease of access to the supply of hard-wood timber has been an important factor in determining the localization of the industry. The Central States produced (1900) 55.6 per cent. of the total product. Ohio, New York, Indiana, and Michigan, in the order named, lead in the value of product, Indiana having the largest capital invested.

Bicycles and Tricycles. The manufacture of bicycles has developed mainly since 1890. The number of establishments increased from 27 in 1890 to 312 in 1900, and the value of products from $2,568,326 in the former year to $31,915,908 in the latter. During the middle of that decade the production greatly exceeded that figure. Since 1890 the United States has led the world in the quality and quantity of bicycles produced, and now exports to all countries. Up to 1900 the Patent Office had granted 7,573 patents for cycles and their component parts—the great majority of them since 1890. The Central States produced 58.5 per cent. of the total product, Illinois and Ohio being in the lead.

Agricultural Implements. The manufacture of agricultural implements has developed rapidly since 1850. The total value of products in that year was $6,842,611, and in 1900, $101,207,428. This growth is due primarily to the increasing demand of the American farmer. Nearly two-thirds of the increase in value of products ($11,243,763) between 1890 and 1900 was due to the rapid increase of exports of agricultural implements during that decade. In 1900 Illinois produced over two-fifths of the total output. It occupied first place in the number of cultivators, harrows, plows, harvesters, and combined harvesters and binders, horse hayrakes, and mowers manufactured, which number includes most of the more elaborate, complicated, and valuable machines. Wisconsin manufactured about one-half the threshers. See under AGRICULTURE.

MUSICAL INSTRUMENTS AND MATERIALS. In 1900 there were 621 establishments manufacturing musical instruments. There were 23,765 wage-earners, and the total product was valued at $44,514,463. The industries consist mainly in the manufacture of pianos, the total value of the manufactured pianos having increased from $5,260,907 in 1860 to $35,428,225 in 1900. For a half century practically all the pianos and most of the other musical instruments used in the United States have been of domestic make. Their manufacture here has been favored by the abundance of wood suitable for sounding boards, as well as for piano cases. Up to the year 1866, 97 per cent. of all the pianos made in the United States were square pianos. In 1900 97.4 per cent. of the pianos were upright. New York, Chicago, and Boston are the chief centres of the industry.

ALCOHOLIC AND MALT LIQUORS. The production of liquors in the United States is about equal to the home consumption. Little (chiefly wine) is imported. In 1900 the value of malt liquors was reported at $237,269,713, distilled liquors at $96,798,443, and vinous liquors at $6,547,310. The first and last estimates included the revenue tax, but only a part of this was included in the estimate for distilled liquors. Malt liquors are of the greater importance by far, the product having increased steadily in amount from 2,006,625 barrels in 1863 to 39,330,849 barrels in 1900. The manufacture of distilled spirits fluctuates enormously from year to year, with only a slight tendency to increase, there being a marked contrast with malt liquors in respect to both steadiness and increase. In 1900 the output amounted to 109,245,187 gallons, which was the largest for any year since 1893. Corn is the principal material used in the production of both, but barley is also extensively used in the manufacture of malt liquors, particularly at Milwaukee, and rye in the manufacture of distilled liquors. The manufacture of both is well distributed over the country. New York, Pennsylvania, Illinois, Wisconsin, and Ohio lead in the value of malt products, while Kentucky and Indiana are well in the lead in the production of distilled liquors. The manufacture of commercial wine did not begin until near 1860, and the principal development has been made since 1890. The product is still very small compared with that of many other countries. It was 39,600,000 gallons in 1901. The industry is localized in the grape-growing regions, California being far in the lead, with Ohio and New York next in importance. The capital invested in the manufacture of alcoholic and malt liquors ($457,674,087 in 1900) is much greater than the combined capital of the flour and grist milling and slaughtering and meat-packing industries. The total number of establishments in 1900 was 2835, and the number of wage-earners employed 44,417.

TOBACCO. The value of the manufactured tobacco products in 1900 was over four-fifths the value of alcoholic liquors, but the value of the capital invested in the former is less than two-sevenths that in the latter. The amount of the manufactures is adjusted to the home demand, there being but little manufactured tobacco imported and almost none exported. The increase in the value of chewing and smoking tobacco and snuff from $21,820,535 in 1860 to $103,754,362 in 1900, and the increase in the value of cigars and cigarettes during the same period from $9,068,778 to $160,223,152, show a remarkable growth, especially in the latter class of products. In consequence of the competition of the cheap German-made cigars, but few cheap cigars were made in this country prior to the tariff acts between 1860 and 1865. The manufacture of cigarettes began still later, but developed so rapidly that in 1897 it actually exceeded in number the cigars made in that year. Almost the entire cigarette product is manufactured by machinery in large establishments. Of the entire product 94 per cent. is made in New York City, Richmond, Va., Durham, N. C., and Rochester, N. Y. Recent inventions have also made it possible to manufacture cigars by machinery, but this method has not yet come into general use. The hand method makes necessary the employment of a large number of workmen. In 1900 there were 142,277 persons employed in tobacco manufacture, or over three times as many as in the flour and grist milling industry.

PRINTING AND PUBLISHING. The value of products accredited to newspapers and periodicals in 1900 was $222,983,569; to book and job products, $121,799,096; and to music, $2,272,385. The wage-earners employed numbered respectively 94,604, 67,610, and 778. The increased use of labor-saving machinery in printing is evidenced by the fact that while the capital invested increased, between 1890 and 1900, 52.4 per cent. and the value of products increased 24 per cent., the number of wage-earners increased only 10 per cent. The publication of books and magazines is confined mainly to a few of the largest cities. The publication of daily papers is much more widely distributed. The publication of weekly papers is even more widely distributed, the weekly being as a rule the only newspaper taken in rural communities. In almost every incorporated town there is a weekly. The publishing-houses in America have profited greatly, since 1890, from the reduced price of paper, due to its manufacture from wood pulp. See the articles on NEWSPAPER; PERIODICAL; PRINTING.

TIN AND TERNE PLATE. The manufacture of tin and terne plate is one of the newest industries in the country, having developed wholly since 1890. In 1900 there were 22 establishments devoted entirely to tin terne dipping, 35 others that combined with this the manufacture of black plate, and 9 others that were restricted to the making of black plate. The total value of the product was $61,912,619, of which $31,892,011 was accredited to tin terne dipping. There were 14,826 wage-earners engaged in the industry. Pennsylvania, Ohio, and Indiana lead.

WOOD PULP AND PAPER. The utilization of the forest resources of the country for the manufacture of paper has developed mainly since 1890. In the $70,530,236 which represented the total cost of products in 1900, wood pulp was the principal item, and the cost of rags, old paper, and manila stock, which 50 years before were the only materials used for paper-making, was only $13,902,092. Spruce constituted 76 per cent. of all wood used in the manufacture of wood pulp, poplar being the only other variety extensively used. The wood-pulp industry is generally located near the source of supply of wood and where water power is available. New England, New York, Pennsylvania, and Wisconsin represent the bulk of the industry. Water power in 1900 constituted two-thirds of the total power used by mills for grinding the wood and for the beating and washing machines, while merely steam power is used for the paper machines. New York leads in the production of newspaper and wrapping paper. Massachusetts is the largest consumer of rags from which are produced writing and other fine papers. The Middle West still consumes large quantities of straw in the manufacture of paper, Indiana being well in the lead. The total value of products for the paper and pulp industry increased from $78,937,184 in 1890 to $127,326,162 in 1900. In the latter year 49,646 wage-earners were employed in 763 establishments.

and the value of products has increased over eleven-fold since that time. In 1900 there were 355 glass manufacturing establishments, 52,818 wage-earners being employed. The value of products was estimated at $56,539,712. Natural gas is the most desirable fuel for use in this industry, and the recent development of the industry has been mainly in the gas fields. In 1900 Pennsylvania produced 38.9 per cent. of the total product, Indiana 26.1 per cent., and Ohio 8.1 per cent. An excellent glass sand is found in southern New Jersey, and this is the only important glass manufacturing region on the Atlantic coast.

CHEMICALS. The American chemical-manufacturing industry has never possessed the advantage of having a large number of highly skilled chemical specialists employed in its service. In 1900 only 276 chemists were employed in the establishments covered by the census. Moreover, the laws of the United States give the foreigner the monopoly of a patent without requiring that the protected article shall be made where the patent is issued. The United States therefore is seriously handicapped in competition with the Germans. Transportation costs, however, have favored the home manufacturer of heavy chemicals, and their production has accordingly increased rapidly. The following table shows the growth of the industry in 1890-1900:

	No. of establishments	Capital, 1900	Average No. wage-earners	Products, value of, 1900	Reclassified products, value of, 1900	Reclassified products, value of, 1890
Chemicals	459	$89,091,430	19,054	$62,676,730	$78,414,840	$55,269,377*
Dyestuffs	77	7,839,034	1,648	7,350,748	7,767,226	8,857,064
Essential oils	70	612,657	199	850,093	859,401	....
Explosives	97	19,465,846	4,502	17,125,418	16,950,976	10,993,131
Fertilizers	422	60,685,753	11,581	44,657,385	45,911,382	35,519,841
Paints and varnishes	615	60,834,921	9,782	69,922,022	71,313,392	52,908,252
Total	1,740	$238,529,641	46,766	$202,582,396	$221,217,217	$163,547,685

*Includes essential oils.

TURPENTINE AND RESIN. The pine forests of the Southern States—particularly Georgia and Florida—are valuable as a source of supply of turpentine, resin, and related products. According to the census estimates, the value of the combined product increased from $8,077,379 in 1890 to $20,344,888 in 1900. In the latter year there were 1503 establishments engaged in the industry. The average number of wage-earners employed was 41,864.

CLAY PRODUCTS. Clay suitable for industrial utilization is found in almost every section of the country. The period 1880-1890 was one of remarkable growth in the production of clay products, the value of products having gained 114.8 per cent. during that period. The corresponding figure for the following decade was 64 per cent., the value in 1900 being $95,533,862. There were in that year 105,693 wage-earners employed in 6423 establishments. Of the total output, $78,336,447 represented the value of the brick, tile, and terra-cotta products, about one-half of which was accredited to common brick. Brick is manufactured in almost every part of the country in quantities sufficient to meet the local demands. The pottery products were valued at $17,197,415. This industry is chiefly in two localities, one in New Jersey and the other in eastern Ohio.

GLASS. The glass industry has made a decided growth during every decade since 1850,

The manufacture of fertilizers is mainly confined to the Atlantic Coast States. The phosphate mines of some of the Southern States supply a large part of the raw materials used in their manufacture. The manufacture of paints and varnishes, explosives and chemicals, is well distributed over the country, New York, Pennsylvania, and New Jersey being especially prominent in the production of chemicals.

RUBBER BOOTS AND SHOES. Since the granting of the Goodyear patent in 1844 the manufacture of rubber boots and shoes has developed into a large industry. The value of the product increased from $9,705,724 in 1880 to $41,089,819 in 1900, the number of establishments from 9 to 22, and the number of wage-earners from 4662 to 14,391. The industry is mainly confined to Massachusetts, Connecticut, and Rhode Island.

LEATHER AND ITS FINISHED PRODUCTS. See table of production under LEATHER.

In recent years there has been a rapid centralization of the tanning industry. This is due partly to the radical changes which have been made since 1880 in the processes and machinery of manufacture, giving large plants an economic advantage, and partly to the combination of sole-leather tanneries with those producing upper leather. During the decade 1890-1900 the capital invested increased 77.4 per cent. Hemlock and oak bark still furnish

This accounts for the enormous recent development of the industry in Wisconsin and some other States. Pennsylvania has twice the production of any other State, Massachusetts, New Jersey, and Wisconsin ranking next in order.

One of the most distinct triumphs of American industry has been made in the manufacture of boots and shoes. Probably no other industry has been so completely revolutionized. Previous to 1845 the industry was strictly a hand process; to-day the shoe factory provides a perfect system of continuous manufacture, involving, in some instances, more than 100 operations. Beginning with the leather-rolling machine, there followed rapidly the wax-thread sewing machine, the peg-making machine, and peg-driving machine, and other machines, of which the most important was the McKay sewing machine, which has perhaps done more to revolutionize the manufacture of shoes than any other single machine. Important inventions are continuously being added to the list. As a result there has been a decided centralization of the industry, the number of establishments having decreased from 2082 in 1890 to 1600 in 1900, and a decided increase in the number of wage-earners relative to the value of products. In 1900 the number of wage-earners was only about one-half greater than in 1850, whereas the value of products was nearly 6 times as great in the later as in the earlier year. There is also an increase in the number of women and children employed. Of the 142,000 factory hands in 1900, 47,186 were women and 4521 children. American shoes are exported in large quantities.

Until well along in the nineteenth century the industry was confined almost wholly to eastern Massachusetts, and that State produced over three-sevenths of the total product in 1900. For a number of years, however, the industry has been rapidly developing in other regions, and almost the entire gain for the decade 1890-1900 was made outside Massachusetts, there being a decided decrease of capital reported for that State. The largest increase was made in Ohio and Missouri, but New York and New Hampshire still rank second and third respectively.

The manufacture of saddlery and harness, particularly the latter, is widely distributed, being usually carried on by small establishments intended to supply the local demand. In the decade 1890-1900 there was a gain in the number of establishments amounting to 63.1 per cent. There is a greater centralization in the manufacture of pocketbooks, trunks, and valises. The manufacture of leather gloves and mittens employed 14,436 persons in 1900, of whom 9754 were women. The value of the product for that year was $17,048,656.

SLAUGHTERING AND MEAT-PACKING. In 1850 slaughtering and meat-packing was of little importance as a specialized industry, the value of the product for that year being only $11,981,642. Before 1890, however, the industry had become the most important of the industries manufacturing food products, and in 1900 was far in the lead, with a total value of products estimated at $785,562,433. There was a proportional increase in the capital invested, which amounted bring about this most remarkable expansion of the industry. The growth in stock-raising and the increase of the population are, of course, important considerations, but the development of the industry has been out of all proportion to either of these. Formerly much of the slaughtering was done by the stock-raiser himself, and the local supply sufficed in most communities. But as large centres of population, developed at a distance from the greater stock-raising regions, created a need for the packing and preserving of meats, a greater specialization of the industry, better facilities of communication, and the devising of processes of preservation and especially of refrigeration made this possible. The refrigerator car, first used in 1869, marked an epoch in the industry, since it made possible the shipment of fresh beef. Refrigeration made possible the continuation of the industry throughout the year, and shipments to foreign countries. (For meat exports, see section *Commerce.*) The exportation of fresh beef began in 1876. About the same time labor-saving devices were adopted and every part of the animal began to be utilized. The decade 1870-80 witnessed the first rapid specialization and centralization of the industry. During that period the value of products increased 300.3 per cent., while the number of establishments increased only 13.5 per cent. In the decade 1890-1900, although the value of products increased 39.9 per cent., the number of establishments decreased from 1118 to 921. The industry has tended to localize near the producing regions at points which have the greatest advantages of transportation. About 1850 the Ohio Valley was the great producing region, and the river towns, with Cincinnati and Louisville in the lead, were the centres of slaughtering and meat-packing. With the subsequent development of stock-raising in Illinois, Iowa, and other Upper Mississippi Valley States, together with the unequaled transportation advantages of Chicago, that city has attained an importance in slaughtering and meat-packing that is unapproached by any other city in the world. The value of products of 1890 was 36.3 per cent., and in 1900 32.7 per cent. of the total for the United States. The relative decrease is the result of the development of the industry in other centres, nearer to the producing region, especially Kansas City, South Omaha, Saint Joseph, Saint Louis, and elsewhere in the Southwest and Northwest. The packing of meats is almost wholly carried on west of the Alleghanies, but New York and other Atlantic Coast centres slaughter extensively for the local market. The value of the hogs slaughtered is considerably in excess of the value of beeves slaughtered. About five-sixths of the beef is sold fresh, while only about two-sevenths of the pork is sold in this form.

TRANSPORTATION—RAILWAYS. The great industrial progress after 1850 was made possible largely by railways. The construction of railways in the United States began toward the close of the decade 1820-30. Their introduction had been preceded by the inauguration of a vast system of canals, the Erie Canal, which was to remain long the principal artery of transportation between the East and West, having been opened in 1825. The growth of the railway system was extremely rapid from the beginning. The mileage increased from 23 in 1830 to 2818 in 1840 and 9021 in 1850. Over much of the country railways preceded industries, and certain industrial developments, such as those of iron and coal and of agriculture in the West, could not have taken place on any great scale without railway advantages. The growth of American railways, in which, it is estimated, from one-seventh to one-fifth of the country's capital is now invested, is shown in the following table (the mileage given being exclusive of elevated city passenger lines):

DIVISIONS OF STATES	1850	1860	1870	1880	1890	1895	1899	1900	1901
New England	2,507	3,660	4,494	5,977	6,831.9	7,199.52	7,447.69	7,501.48	7,518.24
Middle Atlantic	3,105	6,353	10,577	15,147	20,038.11	21,642.11	22,206.55	22,384.85	22,479.02
North Central	1,276	9,583	14,701	25,109	36,976.45	39,448.26	40,849.86	41,138.38	41,961.58
South Atlantic	1,717	3,463	6,481	8,474	17,300.59	20,034.23	21,232.40	21,917.42	22,285.50
Gulf and Mississippi Valley	416	3,727	5,106	6,995	13,342.66	14,459.03	15,717.67	16,211.42	16,643.42
Southwestern	....	1,162	4,625	14,085	32,887.95	34,909.83	36,926.57	37,529.55	39,242.62
Northwestern	....	655	5,004	12,347	27,294.36	29,476.00	31,227.55	32,164.95	32,640.75
Pacific	....	23	1,934	5,128	12,031.34	13,945.96	15,209.29	15,485.54	16,016.17
Total United States	9,021	30,626	52,922	93,262	166,703.36	181,114.94	190,817.58	194,333.59	198,787.30

The rate of growth has greatly fluctuated. Checked by the Civil War, the mileage nearly doubled between 1865 and 1873. From the latter year to 1879 construction was reduced, but it then revived and, with a short interruption in 1884-85, advanced rapidly until 1893, and again continued after 1898. The year 1887 exceeded all others, with 12,876 miles. Prior to 1850 construction was mainly in the Atlantic Coast States, but in 1850-60 noteworthy gains were made in the North Central States and in the South. In 1852 rail connection was established between Chicago and the Atlantic Coast, and in 1869 between the Atlantic and Pacific coasts. In 1870-80 there were important gains in the Upper Mississippi Valley and in eastern Texas, which was the first Southern State to show activity in railway construction after the war. In 1880-90 the Southern States doubled their mileage. Since 1895 (in which year there was the least construction after the Civil War, 1650 miles) the most rapid progress has been between the Gulf of Mexico and the Kansas and Missouri rivers. The greatest railway density is in the region north of the Ohio and Potomac rivers. New Jersey leads with 30 miles of line for each 100 square miles of area.

Among the factors that hastened railway development were the business rivalry between cities or sections, subsidies in one form or another, and the small cost of right of way. State grants in aid (many of them land grants) were common until 1861, when the Federal Government began to make land grants directly to the companies. The first line reaching the Pacific received grants of 33,000,000 acres in addition to a large loan based upon mileage and difficulty of construction. The total Congressional land grants between 1850 and 1871 amounted to 155,000,000 acres, but of these only 97,976,637 acres were patented up to 1902.

In general American railways have been constructed more cheaply than British or Western European, but improvements have been made as warranted by traffic. Thus there is great inequality in the condition of American roads. In 1900 there were 192,556 miles of single track, 12,151 miles of second track, 1094 miles of third track, and 829 miles of fourth track, exclusive of yard tracks and sidings.

The tendency toward railway consolidation appeared soon after 1850. Keen competition did not come until after the Civil War, notably in 1869, when the Pennsylvania Railroad and the New York Central made their connections with Chicago. The development of the 'parallel' lines, or two or more railways connecting the same points, so intensified competition that the companies were forced to seek among themselves some relief. Thus arose, between 1870 and 1880, the 'pools,' or agreements between companies in regard to the distribution of traffic or the benefits of traffic. The prohibition of pools by the Interstate Commerce Act of 1887 renewed competition, to escape which the railway companies came to secret understandings, and 'traffic associations' were formed to fix a 'fair proportion' of the traffic for each railroad involved. In 1897 this form of coöperation was declared illegal by the United States Supreme Court. Thereafter agreements between companies as to rates and the distribution of traffic benefits were more informal, but, according to the Interstate Commerce Commission, the court decisions have had "no practical effect upon the railway operations of the country;" while, in respect to the organization of railways, the inconveniences in the way of 'mutual understandings' accelerated consolidation, notably after 1898. Thus in 1902 more than two-thirds of the total mileage of the United States was included in eight groups of railway interests. See the articles CANAL; EXPRESS; INTERSTATE COMMERCE ACT; POST-OFFICE; RAILWAYS; STEAM NAVIGATION; STREET RAILWAYS; TELEGRAPH; TELEPHONE; TRANSPORTATION.

FOREIGN COMMERCE. The United States does not hold so high a rank in respect to the magnitude of its foreign trade as it does in that of agriculture, manufactures, mining, and transportation. Until near the end of the nineteenth century the foreign trade of the United Kingdom was twice as great, while the foreign trade of Germany still exceeds that of the United States by a considerable margin. The commerce of the United Kingdom ranges from 3 to 4 times as great per capita as does that of the United States. As in the other industries, the chief development has occurred since the middle of the nineteenth century. There was a period, however, in the early years of the nation when the commerce (including re-exports) was greater per capita than it has since been. Through the navigation laws (see paragraphs on *History*), England 'salutary neglect,' the laws were evaded throughout the greater part of the Colonial period. The majority of Colonial merchants were smugglers, and an extensive non-English trade developed, the most important being with the West Indies. The total foreign trade of the thirteen Colonies is estimated to have increased from a value of $12,000,000 in 1750 to $30,000,000 in 1771, the exports amounting respectively to $2,800,000 and $11,000,000. In 1763 England's attitude toward the Colonies was radically changed; the navigation laws were modified and a rigid enforcement of them was begun in order to collect a greater revenue. This new policy helped greatly to precipitate the Revolution. After the war Great Britain subjected the newly independent States to the trade restrictions of the old navigation laws, much to the injury of the States, which were helpless under the Articles of Confederation. The situation hastened the formation and adoption of the new Constitution, under which Congress immediately began retaliatory measures. Discriminating duties were placed upon goods not imported in American vessels. Reciprocal commercial privileges had been secured in the case of some but not all of the European countries, and with the coming of the Napoleonic wars, which created a special demand for breadstuffs, Europe was glad to avail itself of the advantages of American commerce. Our foreign trade jumped from $43,000,000 in 1791 to $247,000,000 in 1807. Of the latter amount $108,500,000 represented exports, of which over half were re-exports. America had become, in proportion to population, the leading commercial nation of the world. The embargo and non-intercourse acts and the War of 1812 greatly reduced the volume of American commerce. In the first two years after the war (1815-1816) there was a rapid revival of trade, and the imports exceeded those of any earlier year; but after 1818 there was a steady decline in commerce until 1830, when the American imports amounted to $62,000,000 and the exports to $71,000,000. It is noteworthy that the rapid development of the country west of the Appalachians had prior to this time added scarcely anything to the commerce of the country. So great were the difficulties of transportation that that section was rendered economically almost independent. The South was not so severely handicapped, especially with regard to exporting cotton, the many navigable streams affording a means of conveying the cotton to the coast. After 1830 trade increased rapidly until 1836, when the American exports amounted to $124,000,000 and the imports to $177,000,000. This was the result in a large measure of the improvements of steam navigation and of canal construction (which afforded a profitable trade with the interior), and of the rapid increase in the production and shipments of cotton. After the panic of 1837 the foreign trade was again backward for a period of ten years. In 1846 the foreign trade was no greater than in 1816, after a period of thirty years. The year 1847 was the beginning of a new era in the foreign trade of the United States. Since that year the trade has rapidly expanded, subject to fluctuation, however, during times as great. The following statement of the general trade by decades is fairly indicative of its growth:

YEAR	Imports	Exports
1850	$173,509,526	$144,375,726
1860	353,616,119	333,576,057
1870	433,958,408	392,771,768
1880	667,954,747	835,638,658
1890	789,310,409	857,328,684
1900	849,941,184	1,394,483,082
1902	903,320,948	1,381,719,401
1903*	1,072,128,364	1,453,090,034

*Includes trade with Alaska, Hawaii, and Porto Rico.

A number of factors aided in the development of commerce about the middle of the century. Among these were the enormous production of gold in California and the repeal of the Corn Laws in Great Britain. But greatest were the rapid development of the interior and the radical improvements in transportation through the construction of railroads and the improvement of steam navigation. It was at about this time, moreover, that machinery began to play an important part in the agricultural and other industries—a movement which is carried to such an extent that the per capita production of American laborers is greater than that in any other country. In consequence there has been a large surplus of products for foreign shipment, and an increasing ability to purchase those products which are not produced at home. From the foregoing table it may be seen that there has been a change from an excess of imports to an excess of exports. This change occurred about 1875, since which year the exports have exceeded the imports, except in the years 1888, 1889, and 1893. The excess of exports in the earlier years of that period was due to the enormous increase in the shipment of raw products, particularly farm products. Exports of these have grown less rapidly in recent years, and the excess of exports since 1896 is largely due to the sudden increase of exports of manufactured products. The imports of manufactured goods decreased from 40 per cent. of the total imports in 1860 to 15 per cent. in 1900. Exports of manufactured goods meanwhile increased slowly from 12.76 per cent. of the total exports in 1860 to 21.14 per cent. in 1894, then advanced rapidly to 31.65 per cent. in 1900, having since fallen a little under that amount. In 1895 the value of exported manufactures was $183,595,743 and in 1902, $403,641,401. The nature of American exports, therefore, is determined by the great abundance of raw products and the advantage thus given, together with the use of machinery in producing machine-made products economically. It also is influenced by the fact that the Western European peoples do not produce enough to supply the whole market, thereby creating a demand for the American surplus products. The American exports consist, therefore, of raw or slightly manufactured products sent to Europe and manufactured products sent to all parts of the world. The imports into the United States consist of raw products which cannot be produced in this country—or which are produced in insufficient quantities—and products which can be produced more economically in other regions. The latter comprise mainly food products and materials for use in manufacturing. A considerable portion, however, consists in manufactures in which cheaply paid European and Oriental hand-labor enters largely, and with which highly paid American labor cannot compete. It also consists of products of highly skilled labor, skill which accrues with the long establishment of an industry and which Americans have not yet acquired. The following table shows the growth of the export trade:

DOMESTIC EXPORTS 1800-1903.

YEARS	Agriculture		Manufactures		Mining		Forest		Fisheries		Miscellaneous		Total exports
	Dollars	Per cent.	Dollars	Per cent.	Dollars	Per cent.	Dollars	Per cent.	Dollars	Per cent.	Dollars	Per cent.	Dollars
1800	25,590,534	80.37	2,493,755	7.83	....	......	2,228,863	7.00	1,098,511	3.45	429,240	1.35	31,840,903
1850	108,605,713	80.51	17,580,456	13.03	167,090	0.12	4,590,747	3.40	2,824,818	2.10	1,131,409	.84	134,900,233
1860	256,560,972	81.13	40,345,892	12.76	999,465	.31	10,299,959	3.26	4,156,480	1.31	3,879,655	5.23	316,242,423
1870	361,188,483	79.35	68,279,764	15.00	5,026,111	1.10	14,897,963	3.27	2,835,508	.62	2,980,512	.66	455,208,341
1880	685,961,091	83.25	102,856,015	12.48	5,863,232	.71	17,321,268	2.11	5,255,402	.64	6,689,345	.81	823,946,353
1890	629,820,808	74.51	151,102,376	17.87	22,297,755	2.64	29,473,084	3.49	7,458,385	.88	5,141,420	.61	845,293,828
1895	553,210,026	69.73	183,595,743	23.14	18,509,814	2.33	28,576,235	3.61	5,328,807	.67	4,171,974	.52	793,392,599
1900	835,858,123	60.98	433,851,756	31.65	37,843,742	2.76	52,218,112	3.81	6,326,620	.46	4,665,218	.34	1,370,763,571
1902	851,465,622	62.83	403,641,401	29.77	39,216,112	2.90	48,188,661	3.55	7,705,065	.57	5,265,000	.38	1,355,481,861
1903	873.285,142	62.72	408,187,207	29.32	38,844,759	2.79	57,830,778	4.15	7,755,232	.56	6,328,519	.46	1,392,231,637

It is noteworthy that after a decade in which no progress was made in the exports of agricultural products (1880-1890), they have again rapidly advanced. The agricultural group includes a number of products usually classed as manufactured, such as flour, meats, etc. Of the agricultural exports, those intended as food are in the aggregate far in the lead. The three principal exports of food in the fiscal year 1903, with their values, were as follows: breadstuffs, $221,242,285; meat and dairy products, $179,839,714; and animals, $34,781,193. Cotton is the largest single item of export, and ranks second to the large group of breadstuffs. The most important items among the breadstuffs are wheat and flour, the average exports of which for the period 1867-72 were 35,500,000 bushels, or 15.53 per cent. of the total production. The exports then rose until the period 1879-83, when the average was 157,566,000 bushels, or 34.91 per cent. of the total production. For the next ten years the exports were much less, absolutely and relatively, but increased during the period 1894-99 to an average of 170,098,000 bushels, or 34.63 per cent. European countries have always entertained a prejudice against corn as a food, but this prejudice seems to have weakened in recent years. The exportation of corn, including corn meal, increased from an average of 14,200,000 bushels in the period 1867-72 to an average of 127,400,000 bushels in the period 1894-99. The exports of the earlier period constituted 1.54 per cent. of the total production, and in the latter 6.56 per cent. Thus corn bids fair soon to become a rival of wheat as an export, in value as well as in volume. The greater part of the exportation in meats consists of hog products, amounting in the year 1903 to $112,110,602, as against $38,470,958 for beef products. The exports of hog products increased rapidly with the development of the slaughtering industry, the total value having increased from $15,309,647 in 1870 to $86,687,858 in 1878, after which they fluctuated about that figure and did not show any tendency to rise until 1898. The exports of bacon in 1903 were valued at $22,178,525, hams at $25,712,633, and lard at $50,854,504, the latter having made a large gain since 1898. Pork is shipped mainly in the salted or pickled form. Exports of beef did not attain any great growth until after the recent facilities for chilling and transporting meats had been introduced. With these improvements there has been a change from salted to fresh beef in the shipments, the latter variety constituting nearly three-fourths of the total beef shipment in 1903. In that year there were over $20,000,000 worth of 'other meat' products exported, over one-half of which was oleomargarine. The value of dairy products exported for that year was only $4,775,582. The exports of live animals consist chiefly of cattle. Their exportation did not take firm hold until 1879. In the year 1890 there was a striking advance in the shipment of cattle, but since that year there have been no decided tendencies toward increase or decrease. The value of exports of cattle in 1903 was $29,848,936. The Anglo-Boer War greatly increased the exportation of horses and mules, the exports of the former in 1902 being valued at $10,048,046.

The exports of cotton in 1903 amounted to 3,543,043,022 pounds (value $316,180,429), which was about two and one-half times the quantity exported in 1876. For most of the intervening years the per cent. of the total crop exported has been between sixty-five and seventy, and there is no tendency to change the ratio. Among other agricultural products exported, the most important are: tobacco, valued in 1903 at $35,250,893;

YEAR ENDING JUNE 30	Iron and steel manufactures	Copper manufactures	Agricultural implements	Wood manufactures	Mineral oils, refined	Chemicals, drugs, dyes, etc.	Leather and manufactures of leather	Cotton manufactures	Paraffin and paraffin wax	Paper and manufactures of paper
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
1870	13,483,163	504,741	1,068,476	2,613,715	30,431,668	3,118,984	678,331	3,787,282	374	514,592
1880	14,716,524	793,455	2,245,742	3,975,694	34,291,418	4,174,070	6,760,186	10,467,651	391,566	1,201,143
1890	25,542 208	2,349,392	3,859,184	6,509,645	44,658,854	5,424,279	12,438,847	9,999,277	2,408,709	1,226,686
1895	32,000,989	14,468,703	5,413,075	6,249,807	41,498,372	8,130,334	15,614,407	13,789,810	3,569,614	2,185,257
1900	121,913,548	57,852,960	16,099,14[illegible]	11,232,838	68,247,588	12,132,373	27,293,010	24,003,087	8,602,723	6,215,833
1902	98,552,562	41,218,373	16,286,740	11,617,690	66,218,004	12,141,011	29,798,323	32,108,362	8,858,844	7,312,030
1903	96,642,467	39,667,196	21,006,622	13,071,251	60,923,634	13,697,601	31,617,389	32,216,304	9,411,294	7,180,014

not enough to affect greatly the percentage which they constitute of the total. The largest item in the group of minerals exported is coal, while boards and naval stores are the largest items in the exports of forest products. The preceding table shows the growth in the exportation of the ten principal articles of domestic manufacture, which together form about 80 per cent. of the total manufactures exported.

The exports of iron and steel include a large list of articles, chief of which are locks, hinges, and other builders' hardware, electrical machinery, wire, pipes, and fittings, steel rails, sewing machines, locomotive engines, and structural ironwork and steel. About five-sixths of the total value of mineral oils exported is represented by illuminating oils. The extraordinary growth in the exports of cotton manufactures has taken place mainly since 1893, and is the result of the increased use of electricity, in connection with which most of the product is utilized. One-half of the exports of cotton manufactures is represented by uncolored cloths. The most rapid growth in the exportation of leather and its manufactures in recent years has been in upper leather, and in boots and shoes. In 1895, 822,412 pairs of boots and shoes were exported, and in 1902, 3,966,766 pairs. Nearly one-half of the value of exported agricultural implements is represented by mowers and reapers. The following table shows the growth of the importation of merchandise into the United States for consumption; the percentage figures indicate the proportion of the specified classes to the total imports:

YEAR	Articles manufactured wholly or partially for use as materials in mechanic arts		Articles manufactured ready for consumption		Articles of voluntary use, luxuries, etc.		Manufactures of all classes		Food and live animals		Crude articles for domestic industries	
	Dollars	Per cent.	Dollars	Per cent.	Dollars	Per cent.	Dollars	Per cent.	Dollars	Per cent.	Dollars	Per cent.
1870.........	53,658,296	12.59	119,298,235	27.98	47,266,822	11.09	217,689,681	51.06	139,213,092	32.65	66,909,565	15.69
1880.........	73,186,963	11.66	130,004,643	20.72	65,141,826	10.38	263,293,201	41.95	199,165,963	31.72	160,055,876	25.52
1890.........	84,700,568	10.94	154,469,354	19.96	107,468,732	13.91	328,830,609	42.50	248,600,646	32.13	178,435,512	23.06
1895.........	83,768,478	11.46	140,773,811	19.25	92,714,887	12.68	301,918,566	41.29	226,422,171	30.97	187,482,743	25.64
1900.........	80,575,042	9.70	130,577,155	15.72	103,908,719	12.51	297,820,500	35.86	216,107,303	26.02	299,351,033	36.04
1902.........	86,645,277	9.63	151,410,397	16.83	128,184,041	14.24	344,816,408	38.32	205,047,442	22.79	328,506,597	36.51

The table reveals the effect of the establishment of manufactures in the United States; in fact, imports of manufactures have increased absolutely but little in recent years, and for a long period of years have tended to decrease relatively, while at the same time the importation of crude articles for domestic industries has increased both absolutely and relatively. The importation of materials for manufacturing ($415,151,874 in 1902) greatly exceeds the imports of manufactures, and even the exports of manufactures. The importation of food and live animals has begun to decline absolutely and relatively. The bulk of the food group is sugar and coffee, amounting in 1902 to $55,061,097 and $70,982,155, respectively, and constituting the two largest items of importation into the United States. The only other large food item in imports is fruit and nuts, the value in 1902 being

rubber and gutta percha, crude, $27,094,622; fibres, vegetables and textile grasses, $31,526,674; copper manufactures, $24,865,301; tin in bars, etc., $19,463,736; chemicals, drugs, and dyes, $19,818,689; and wool, hair of the camel, goat, alpaca, etc., $18,466,122. The principal item in the group headed "partially or wholly manufactured, etc." was chemicals, drugs, and dyes, not elsewhere specified, valued in 1902 at $35,286,164. Of imported articles ready for consumption and luxuries, the most important was cotton goods, $44,460,126, of which laces, edgings, etc., constituted over one-half; this was followed by manufactures of fibres, $39,036,364; silk, $32,640,242; iron and steel manufactures, $27,180,247; diamonds and jewelry, $25,990,570; and manufactures of wool, camel's hair, etc., $17,384,463. As compared with 1901 there were large increases in the imports of cotton goods, manufactures of fibres, and jewelry. Iron and silk remained about the same, while manufactures of wool, camel's hair, etc., decreased over one-half.

The bulk of the foreign trade of the United States is by sea and with non-contiguous countries. In 1903 the imports by way of the Atlantic ports constituted 80.06 per cent. of the total imports and the exports 63.6 per cent. of the total exports. The Government reports show, however, that from 1893 to 1903 the percentage of gain was greater for the Pacific ports than for the Atlantic. During that period the Atlantic ports showed an increase of 14 per cent. in imports and 46 per cent. in exports, while the Pacific ports showed gains of 17 per cent. in imports and 87 per cent. in exports. The imports by way of the Gulf ports for the same period showed an increase of but 1 per cent. and the exports an increase of only 6 per cent. Of the foreign trade of the United States during the fiscal year 1903, 64.5 per cent. was with the Continent of Europe, and the bulk of this was with the four Western European countries, the United Kingdom, Germany, France, and the Netherlands. The protective tariff of some of the European countries greatly restricts our exports to them, as in the case of France, and in the case of some almost prohibits our exports, as Austria-Hungary. The United Kingdom accepts our exports free of duty, and constitutes by far the greatest market of the world for American products. In 1903 the exports to the United Kingdom amounted to $524,691,638 as against $504,896,090 for the remainder of Europe. If with the United Kingdom are included the other parts of the British Empire, it is found that the American exports to the Empire constitute more than half of the entire American export trade. In the import trade of the United States, however, Europe, especially the United Kingdom, is of much less importance, as can be seen in the table on page 680, showing the foreign trade with the principal countries of the world.

In the case of a number of countries outside of Europe the balance of trade is against the United States. The following table shows what part the United States played in the total foreign trade of the different continents of the world in 1897:

	Imports from U. S. Per cent. of total imports	Exports to the U. S. Per cent. of total exports
Europe	12.32	8.03
N'th America (except U. S.)	42.90	34.23
South America	11.01	29.79
Africa	4.22	30.00
Asia	4.51	7.52
Australia	6.70	10.00

The corresponding percentage of imports from the United States to the United Kingdom varied within the compass 26.5 per cent., and 34 per cent. during the period 1888 to 1898, while the exports to the United States constituted from 21 to 14 per cent. of its foreign exports. The imports of Germany from the United States rose from 7.9 per cent. of its total imports in 1889 to 14.1 per cent. in 1897, its exports to the United States meanwhile varying from 9.1 per cent. to 12.5 per cent. of its total exports. The largest Asiatic customer of the United States is Japan, which the United States supplied in 1898 with 14.2 per cent. of its total imports, taking 29.1 per cent. of its exports. The favorable one-sided trade with Europe is explained by the fact that Europe requires the great bulk of the American surplus products for food for its people and raw materials for its manufactures, while, on the other hand, Europe has little that the United States desires, besides manufactures, and in these the United States is becoming more and more independent. The unfavorable one-sided trade with South America and some other countries, mostly tropical, has a partial explanation in the fact that they are the great producers of the raw products which are for climatic or other reasons insufficiently produced in the United States; nor do they need the raw products of the United States, and have not yet advanced to an industrial stage requiring much of our manufactured products. The latter part of the explanation is not altogether satisfactory, since those countries import large quantities of manufactured products from Europe. The condition of the trade of the United States with South America is by far the most unsatisfactory aspect of our foreign commerce. Much of the blame for the small exports of the United States to South America has been credited to American shipping and to American capitalists and merchants. Many European lines carry on trade with South America, but only a few United States lines (see section *Shipping*); and the freight rates of these are much higher than those of European lines. Flour has been shipped to Europe and thence reshipped to the West Indies cheaper than it could have been sent by direct shipment. American capitalists have found profitable investment at home, and have not been induced to take many risks in South America. American merchants refuse to give so long a credit period as the Europeans do, and have not studied closely the nature of the wants of that region, nor have they contrived methods to deliver goods in a style most suitable to the tastes of the people, as have their European competitors. The trade of the United States with Mexico and Central America, on the contrary, is developing rapidly. In 1897 73.64 per cent. of the Mexican exports were sent to the United States, and 49.29 per cent. of the Mexican imports were received from the United States. The corresponding figures for Central America were respectively 36.72 per cent. and 36.71 per cent. The West Indian trade with the United States is less satisfactory, the corresponding per cent. being 26.49 per cent. and 19.82 per cent. For the trade relations with Porto Rico, Philippines, Hawaii, etc., see under section *Colonies*.

In the United States trade with Great Britain in recent years there has been a rapid increase in our exports, while the imports have actually declined. (See table.) The United Kingdom is the largest market for the United States for food products, manufacturers' materials, and manufactured products. Raw cotton is the largest single item in its imports, being valued in 1903 at $124,789,603. It is, however, exceeded by the combined imports of animals and animal products, and is rivaled by the aggregate imports of breadstuffs. The United Kingdom annually takes from one-half to two-thirds of the total United States exports of wheat and flour, the value of wheat imports in 1903 being $36,139,752, and flour $37,837,512. The United Kingdom's imports of American corn the same year were valued at $17,081,693. In 1903 the United Kingdom took live cattle to the value of $26,597,390 out of a total shipment valued at $29,848,936. Canada and in recent years Argentina compete with the United States in this trade, but the United States still supplies the United Kingdom with from three-fifths to two-thirds of its imports of live cattle. The United States also supplies the United Kingdom with over two-thirds of its imports of fresh beef, Australia being the chief competitor. The United States is the United Kingdom's chief source of supply for bacon and hams. The latter country annually receives over two-thirds of the United States exports of these products and about one-third of its exports of lard. Of the total exports of manufactured products in 1902, nearly one-half went to Europe, and one-half of these went to the United Kingdom. The value of this class of exports to the United Kingdom increased from $40,000,000 in 1892 to $100,000,000 in 1902. The articles exported are remarkably comprehensive in their scope. The prominent items include leather, machinery, copper work, wood manufactures, petroleum, and paraffin. One hundred locomotives have been exported in a single year, besides large numbers of printing presses and typesetting machines. The chief imports of the United States from the United Kingdom and their values in 1902 were as follows: Cotton goods, $16,376,611; manufactured fibres, $21,077,326; iron and steel manufactures, $15,040,085; and woolen goods, $7,473,587. With

IMPORTS AND EXPORTS OF DOMESTIC AND FOREIGN MERCHANDISE. YEAR ENDING JUNE 30

COUNTRIES	Imports		Exports	
	1893	1903	1893	1903
EUROPE				
United Kingdom	$182,859,769	$191,666,505	$421,134,551	$524,691,638
Germany	96,210,203	119,837,908	83,578,988	193,555,495
France	76,076,215	91,060,702	46,619,138	77,542,436
Italy	26,250,241	36,368,860	13,019,539	35,022,660
Netherlands	17,448,948	22,710,673	38,505,193	78,245,419
Switzerland	16,010,728	21,183,378	7,391	205,647
Belgium	11,166,196	22,766,830	26,740,434	47,073,160
Austria-Hungary	10,054,501	10,578,702	571,037	7,209,855
Russia, Baltic and White Seas	3,091,479	7,731,441	2,035,581	13,399,370
Russia, Black Sea	2,703,617	1,508,341	266,242	2,723,258
Spain	5,694,553	8,474,528	13,460,083	17,626,084
Sweden and Norway	4,176,384	4,905,234	4,084,704	10,160,874
Turkey in Europe	2,215,464	5,672,578	45,889	496,785
Portugal	2,689,731	3,488,185	5,727,334	3,652,194
Greece	1,283,557	1,326,935	180,461	330,544
Denmark	235,855	600,193	5,270,434	16,144,985
Rumania	....	6,554	48,798	256,927
Greenland, Iceland, etc	110,613	100,606	2,800	508
Gibraltar	181,220	6,471	434,226	427,005
Azores and Madeira Islands	27,011	16,588	293,887	369,405
Malta, Gozo, etc	....	20,043	....	453,529
Servia	23,808	25,263	....	....
Total Europe	$458,450,093	$550,056,518	$661,976,710	$1,029,587,728
NORTH AMERICA				
West Indies:				
Cuba	$78,706,506	$62,341,942	$24,157,698	$21,769,572
British	16,028,592	13,454,557	8,044,846	10,137,055
Santo Domingo	2,396,315	2,833,676	1,143,479	1,390,967
Porto Rico	4,008,623	16,909,147	2,510,607	11,976,134
Haiti	736,021	1,107,734	5,472,040	2,383,424
Danish	547,626	734,020	604,323	633,710
Dutch	271,594	406,249	752,703	977,559
French	8,340	19,538	1,818,955	1,611,002
Total West Indies	$102,703,617	$91,806,868	$44,504,651	$50,879,423
Alaska	....	$9,266,504	....	$10,188,220
British North America:				
Quebec, Ontario, etc	$29,186,239	$37,942,258	$41,300,151	$109,828,167
British Columbia	2,884,510	6,342,937	1,832,079	6,005,070
Nova Scotia, New Brunswick, etc	5,706,714	10,375,215	3,662,101	7,639,179
Newfoundland and Labrador	408,879	868,238	1,834,177	2,509,415
Total British North America	$38,186,342	$55,528,648	$48,628,508	$125,981,831
Mexico	$33,555,099	$41,254,542	$19,568,634	$42,227,786
Central American States:				
Guatemala	$2,554,710	$2,400,063	$1,763,862	$1,128,045
Costa Rica	2,309,358	3,731,523	1,210,740	1,858,604
Nicaragua	1,400,236	1,862,217	937,859	1,399,696
Honduras	684,912	1,373,131	471,695	956,198
Salvador	1,355,730	891,987	1,138,430	797,253
Total Central American States	$8,304,946	$10,258,921	$5,522,586	$6,139,791
Bermuda	$759,846	$592,107	$962,116	$1,327,626
British Honduras	155,171	376,967	405,168	868,578
Miquelon, Langley, etc	67,691	18,668	197,226	191,150
Total North America	$183,732,712	$209,103,220	$119,788,889	$237,804,405
SOUTH AMERICA				
Brazil	$76,222,138	$67,216,348	$12,388,124	$10,738,748
Chile	3,995,441	9,377,313	2,960,831	4,038,875
Argentina	5,239,095	9,463,832	4,979,696	11,430,496
Venezuela	3,625,118	5,312,954	4,207,661	1,878,202
Guianas:				
British	$5,029,178	$3,351,656	$2,000,675	$1,936,524
Dutch	1,079,710	874,454	373,359	555,398
French	35,965	215,811	113,353	351,262
Total Guianas	$6.144,853	$4,441,921	$2,487,387	$2,843,184
Peru	$819,168	$2,703,643	$636,721	$2,971,411
Colombia	3,572,918	4,184,149	3,155,777	4,293,295
Uruguay	1,623,380	2,981,632	960,606	1,505,109
Ecuador	960,228	1,726,851	817,425	1,353,162
Bolivia	5,476	1,500	24,849	49,107
Paraguay	....	2,887	....	13,021
Total South America	$102,207,815	$107,413,030	$32,639,077	$41,114,6[illegible]

Countries	Imports		Exports	
	1893	1903	1893	1903
ASIA				
East Indies:				
British	$25,968,554	$49,774,589	$3,152,760	$4,795,411
Dutch	8,696,588	16,277,606	1,188,605	1,194,510
Portuguese		28		78
French		10	156,020	131,692
Total East Indies	$34,665,142	$66,052,233	$4,492,385	$6,121,691
Japan	$27,454,220	$44,142,562	$3,195,494	$20,924,862
Chinese Empire	20,636,535	26,769,612	3,900,457	18,603,369
Turkey in Asia	3,533,197	4,897,428	132,786	276,247
Aden	2,471,937	2,328,654		1,508,999
Hong Kong	878,078	1,355,444	4,216,602	8,780,741
All other Asia	75,276	212,268	139,039	77,004
Korea	79			171,400
China:				
British		22,355		1,670
French				4,300
German				
Russian		1,655		681,756
Russia, Asiatic	381,919	28,230	145,591	802,428
Total Asia	$90,096,383	$145,810,441	$16,222,354	$57,954,467
OCEANIA				
Hawaii	$9,146,767	$26,201,175	$2,827,663	$10,787,666
British Australasia	7,266,808	6,969,017	7,921,228	32,748,580
British Oceania		2,067,812		98,669
Philippine Islands	9,159,857	11,372,584	154,378	4,038,909
French Oceania	423,946	579,457	296,208	398,169
German Oceania		25,442		120,041
All other		10,049		3,668
Total Oceania	$25,997,378	$47,245,536	$11,199,477	$48,195,702
AFRICA				
German Africa		$29,526		$ 6,313
Italian Africa		2,584		
Turkey in Africa:				
Egypt	$3,438,925	10,661,978	$128,687	740,375
Tripoli		133,524		
British Africa	716,376	971,908	3,688,999	33,788,629
French Africa	309,327	450,690	529,921	410,097
Canary Islands	39,523	42,547	209,989	815,463
Spanish Africa		20,404		2,266
Liberia	26,002	2,747	26,302	29,086
Portuguese Africa	28,144		200,075	2,324,216
Madagascar	218,196	10,450	642,207	19,278
All other Africa	1,080,539	173,261	412,507	297,408
Total Africa	$5,857,032	$12,499,619	$5,838,687	$38,433,131
All other countries	$59,509			
Grand total	$866,400,922	$1,072,128,364	$847,665,194	$1,453,090,034
RECAPITULATION				
Europe	$458,450,098	$550,056,518	$661,976,710	$1,029,587,728
North America	183,732,712	209,103,220	119,788,889	237,804,405
South America	102,207,815	107,413,030	32,639,077	41,114,601
Asia	90,096,383	145,810,441	16,222,354	57,954,467
Oceania	25,997,378	47,245,536	11,199,477	48,195,702
Africa	5,857,032	12,499,619	5,838,687	38,433,131
All other countries	59,509			

Germany, the second greatest customer of the United States, the balance of trade is growing in favor of the United States. The largest export of the United States to that empire is also cotton, valued in 1903 at $84,824,284. Germany depends upon the United States for its supply of lard, the imports of which in 1903 were valued at $15,448,598. Imports of other varieties of pork products have been greatly limited through adverse legislation. Germany is becoming an important market for American breadstuffs. The manufactured products supplied Germany by the United States increased from less than $10,000,000 in 1882 to $54,000,000 in 1902. The chief imports into the United States from Germany consist of chemicals, drugs, etc., valued in 1902 at $16,166,775; cotton goods, $11,071,974; and iron and steel products, $6,161,651. The French tariffs have thrown the balance of trade against the United States. The principal exports of the United States to France are cotton, copper products, wheat, and petroleum. The United States receives a large part of its silk and elaborately wrought goods from France.

Shipping, Foreign. The United States is far in advance of all other nations in the magnitude of its domestic shipping, but in its foreign shipping, when the vastness of its foreign trade is considered, it holds a very low rank. Indeed, American foreign shipping presents a most marked contrast to all other groups of industry in the United States. Whereas, as has been seen above, other industries have had a most remarkable development since the middle of the nineteenth century, American foreign shipping has since that time suffered an extraordinary decaimportant industry of the New England colonies. The navigation laws of the mother country tended, on the whole, to foster colonial shipping. The first Congress under the present Constitution, in order to provide for and protect American shipping, placed discriminating duties on goods imported under foreign flags, and tonnage taxes upon the vessels which bore it. The long period of European wars gave American shipping as neutral vessels an advantage in the foreign carrying trade, and the aggregate registered tonnage increased from 123,893 tons, carrying 23.6 per cent. of the American foreign trade, in 1789, to 597,777 tons in 1797, and 981,019 tons in 1810, carrying 91.5 per cent. of the American foreign trade. The tonnage then declined somewhat for a long period, but began to revive about 1840, and in 1847 amounted to 1,047,454 tons, carrying 81.1 per cent. of the American foreign trade, and continuing to increase until 1861, when the tonnage amounted to 2,496,894 tons, carrying 65.2 per cent. of the American foreign trade. A large part of the tonnage, however, was engaged in non-American trade, and it is estimated that the aggregate American tonnage was 50 per cent. greater than that necessary to carry the American trade. If to this tonnage were added that engaged in the coastwise trade in fishing and interior shipping, raising the aggregate to 5,539,813 tons, it is found that it is almost as great as the total tonnage of Great Britain and its dependencies (5,895,369 tons) in the same year. The States had an advantage over Great Britain in that they possessed abundant supplies of timber—the chief material used in ship construction. At the same time they had departed from British models and had developed a type of ship that was safer and speedier than those of their foreign competitors, so that the demand for them was great, and the freight rates were in their favor. Great Britain sought to free itself from this handicap by changing from sail to steam navigation, a policy encouraged by the Government through the granting of subsidies to steamship lines. The United States Government a few years later (1845) began a similar policy by an act intended to give mail contracts to steamships, and, in 1847, by authorizing the construction of seven merchant steamers for mail purposes. The tonnage of steam vessels then increased rapidly from 16,000 tons in 1848 to 62,390 in 1851, which was almost equal to that of the United Kingdom in the same year. The United States reduced its mail subsidies, and after the total steam tonnage had reached the maximum of 115,045 tons in 1855 it decreased until after the Civil War. A more efficient method of the British in removing their handicap was to change from wood to iron, and later to steel, as the principal material used in ship construction. Iron and steel vessels could be built larger and otherwise contribute to making possible cheaper freights. The British had iron in abundance, whereas the United States had not produced it in large quantities, and the tariff prevented its importation. The decline in American shipping had actually begun before the war. During the war period Confederate

The United States tonnage was reduced to 1,486,749 tons in 1864, carrying 27.5 per cent. of the foreign trade. After standing at about that figure until 1879, it began to decline, until in 1898, when it was only 726,213 tons, carrying 9.3 per cent. of the foreign trade, and in 1902, 873,235 tons, carrying 8.8 per cent. of the foreign trade. The American steam tonnage registered in the foreign trade increased from 224,100 tons in 1894 to 398,000 tons in 1902. The following table shows the share that was carried under the American flag in 1899 of the foreign sea trade of the United States:

COUNTRIES	Imports	Exports
Europe	4.36	1.27
North America	36.91	51.72
South America	12.27	19.30
Asia	7.70	11.16
Oceania	59.16	31.70
Africa	3.14	8.29
Total	12.36	6.70

The following table shows the number of United States and foreign vessels plying regularly between ports of the United States and ports to the south:

COUNTRIES	U. S.	Foreign
West Indies	26	67
Mexico and Central America	27	43
South America on Caribbean Sea	4	25
South America on Atlantic	0	110
South America on Pacific	9	8
Total	66	253

A number of causes are held responsible for the decadence of American shipping since the war. No doubt the fact that the development of the great interior of the country was more attractive to capital had its effect. The American registration laws have since the first Congress prohibited the registration of foreign-built ships, and the tariff against steel, hemp, etc., prevented the American importation of shipbuilding material, both of which provisions have been accused of playing a part in the decadence of our shipping. It is now claimed that the material for construction can be obtained in America cheaper than the British builders can get it, but that there is a greater cost both in the construction of the ships and in the sailing of them, because labor is much more highly paid in the United States than it is abroad. The fact that foreign countries grant heavy subsidies to aid the maintenance of shipping, while the United States has not maintained such a policy, has made the competition an uneven one, and, since the recent development of public interest concerning the serious condition of our foreign shipping, the idea of establishing some form of subsidy by the United States as a solution of the shipping problem has won great popularity. American capital has meanwhile begun to participate largely in the foreign trade, through investments in ships which continue to sail under foreign flags. From 1894 to 1902 there was an increase from 200,000 tons to over 1,000,-

000 tons of foreign shipping in which American capital has held large interests. An American corporation has been established, which is the largest and most completely equipped steamship company, but only sixteen of its 136 steamers are entitled to the American flag. In the formation of this company—the International Mercantile Marine Company—the following companies were purchased:

COMPANIES	Steamers	Tonnage
Leyland Line	49	295,133
White Star Line	26	266,140
International Navigation Co.	24	180,639
Atlantic Transport Line	23	182,860
Dominion Line	14	110,112
Total	136	1,034,884

Shipping, Coastwise and Interior. Since 1789 the American navigation laws have practically, and since 1817 absolutely, prohibited any but American vessels from participating in the coasting trade of the United States. Therefore the enormous domestic trade of the United States—the seacoast, lake, and river trade—has always been monopolized by American ship-owners and seamen. The facilities offered by the waterways of the United States greatly favor a large domestic shipping trade. There are 5200 miles of the United States frontier bordering on the oceans and the Gulf of Mexico, and an additional 2100 miles on lake and river. Furthermore, there is no other country in which rivers afford so great access to the interior as the United States. It is estimated that the United States has 18,000 miles of navigable riverway. On the Atlantic coast there are a large number of rivers, from the Saint Croix in Maine to the Saint John's in Florida, that are navigable from 50 to 200 miles inland; and there is no very considerable stretch of the coast that is not able to participate in the coastwise trade. The Gulf coast region is similarly favored with navigable rivers and with ports. The Mississippi River system gives water communication with the vast portion of the interior of the country. The Pacific coast is less favored with navigable rivers or with port sites, but the inlets at San Francisco, Portland, and Puget Sound have tributary navigable rivers, and are superior ports.

(For river and harbor improvements, see Harbor.) No other nation has a domestic seaboard or lake trade comparable with the American, or a river trade that equals that of the United States. In 1898 the United States had 3,959,702 tons engaged in domestic seaboard trade; while the United Kingdom owned only 846,008 tons that were engaged in its own coastwise trade. In the accompanying table it will be seen that the development of the coasting trade has made good the loss sustained in the tonnage engaged in the foreign trade and in fisheries.

YEARS	Foreign trade		Coasting trade		Whale and sea fisheries	Total
	Steam	Total	Steam	Total		
1861	102,608	2,496,894	774,596	2,704,544	338,375	5,539,813
1871	180,914	1,363,652	906,723	2,764,600	154,355	4,282,607
1881	152,769	1,297,035	1,112,232	2,646,011	114,688	4,057,734
1891	235,070	988,719	1,776,269	3,609,876	86,164	4,684,759
1901	426,259	875,595	2,491,231	4,582,645	61,978	5,524,218
1902	455,017	873,235	2,718,049	4,858,714	65,953	5,797,902

In 1902, 2,347,977 tons of the sail vessels (including canal boats and barges) were of wood, and 273,051 tons of iron and steel. The steam vessels comprised 1,270,046 tons constructed of wood and 1,906,824 of iron and steel. The distribution of the shipping tonnage in 1901 is shown in the following table:

DIVISIONS	Sailing vessels		Steam vessels		Canal boats		Barges		Total	
	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons
Atlantic and Gulf	11,291	1,243,659	3,708	1,268,041	249	31,520	1,792	435,656	17,040	2,978,876
Porto Rico	35	4,459	7	1,721	......	....	....	....	42	6,180
Pacific	952	354,007	996	351,219	......	....	544	36,599	2,492	741,825
Hawaii	33	20,939	28	11,447	......	....	....	....	61	32,386
Northern lakes	726	318,032	1,795	1,377,872	454	47,888	197	72,719	3,172	1,816,511
Western rivers	36	782	1,193	166,574	......	....	237	54,768	1,466	222,124
Total, 1901	13,073	1,941,878	7,727	3,176,874	703	79,408	2,770	599,742	24,273	5,797,902

There are no statistics showing the amount of cargo carried in the coastwise trade, as there are in the foreign trade, and its magnitude is not known. The most extensive coast trade centres in New York, largely with Boston on the one side, and Philadelphia on the other. San Francisco is the largest centre of the coastwise trade on the Pacific coast, but Seattle plays an important part in the coasting trade with Alaska. In 1900 products to the value of $5,052,051 were shipped from New York to San Francisco via the Isthmus of Panama, and products to the value of $1,765,729 were shipped from San Francisco to New York by the same route. The shipping facilities afforded by the Great Lakes are of inestimable value. See Great Lakes.

Shipping on the Mississippi System. Prior to the Civil War the Mississippi River system played a much more important part in the development of the interior of the country than did the Great Lakes. While the freight tonnage carried upon it is greater than ever before, the nature of the traffic has greatly changed, and the competition of the railroads has affected the river shipping much more than it has that of the lakes. The river was but little navigated for purposes of commerce prior to 1778. For many years the river was of importance to its tributary region chiefly as a means of marketing the surplus products of the newly settled region, since freight could not be profitably transported up stream. The methods used to transport the freight down stream were of the crudest kind. The most common carrier was the flatboat, rudely constructed from timber and without any other propelling force than the current of the river. After it had carried its load to the New Orleans market it was broken up for lumber or deserted. In 1812 the first steamboat was placed upon the river, and with the improvements that rapidly followed in steam navigation, the up-stream traffic also became large. In 1820 the upward movement of freight on the Mississippi amounted to about 100,000 tons, of which 33,300 tons were carried by steamers, and the remainder by barges, etc. In 1845, 2050 steamboats and 346 keel and flat boats arrived at Saint Louis, of which 250 were from New Orleans, 406 from the Ohio, including the Cumberland and Tennessee rivers, 298 from the Illinois River, 643 from the Mississippi above the Missouri, 249 from the Missouri River, and 204 from other ports. The arrivals at Saint Paul increased from 41 in 1844 to 846 in 1856. The years 1840 to 1859 constituted the palmy days of Mississippi navigation. Since then, over the greater part of the Mississippi Valley, the railroad has obtained most of the passenger traffic and most of the freight, except bulky products, chiefly coal and lumber. In 1900 the coal carried amounted to 8,539,224 tons, its movement being almost wholly upon the Ohio and its tributaries. The lumber and forest product carried in that year amounted to 9,300,641 tons, which were well distributed between the different tributaries and the main stream. In recent years the bulk of the traffic has been carried on barges towed by steamers.

BANKING. See BANK, BANKING.

GOVERNMENT—NATIONAL. The outline of the national government is found in the Constitution framed in 1787 (see CONSTITUTION) and various acts of Congress passed in pursuance thereof. In structure and character it is a representative, federal, coördinated, elective, congressional government. Its representative character consists in the fact that the organization of the State is separate and distinct from that of the Government. It is federal in that it is part of a dual system under a common sovereignty. The distribution of the legislative, executive, and judicial powers of the central Government, among separate and distinct organs, contributes the feature of coördination. The popular choice of the executive and law-making branches makes the Government substantially elective, while the independence of the executive as over against the legislative makes the system congressional rather than ministerial in method of action. In distributing the powers of government the framers of the Constitution followed Colonial and English precedent, and confided to separate and distinct organs the exercise of those functions which were legislative in character, those which were executive, and those which were judicial. The investment of the President with the power to recommend to the legislative department the enactment of laws, the right of a qualified veto on its acts and resolutions, and the right of the lower branch of the legislature to impeach and the right of the upper branch to try all officers of the United States for certain offenses, are well-known exceptions to the general principle of the separation of powers. The same may be said of the power confided to the upper branch of the legislature to participate with the executive in the appointment of officers and the negotiation of treaties with foreign countries.

For the Constitution, see CONSTITUTION OF THE UNITED STATES; CONSTITUTIONAL LAW; FEDERAL GOVERNMENT.

For the legislative branch, see CONGRESS; PARLIAMENTARY LAW; LEGISLATURE; LEGISLATION; REPRESENTATION; SENATE; SPEAKER; COMMITTEE; QUORUM, etc.

For the executive branch, see PRESIDENT; ELECTORAL COLLEGE; CABINET; STATE, DEPARTMENT OF; TREASURY, DEPARTMENT OF, etc.

For the judicial branch, see SUPREME COURT OF THE UNITED STATES; COURT.

CONGRESS. The origin of the national legislature is to be found in the so-called Second Continental Congress of 1775—a revolutionary body which was called to deliberate upon the state of public affairs growing out of the dispute with Great Britain, and which, with the acquiescence of the people, assumed plenary powers of government and the management of the war. Although its powers were undefined (there being no written constitution), the Congress exercised many of the usual functions of sovereign governments, among which may be mentioned the organization of a diplomatic service and the conclusion of treaties with foreign States; the regulation of commerce; the raising and equipment of armies; the establishment of a post-office; the creation of a national currency, etc. Delegates were usually appointed by popular conventions or legislatures, the Congress was organized in one chamber, and the States enjoyed equality of representation. The Articles of Confederation ratified in 1781 changed the basis of the Congress from a revolutionary assembly to a constitutional body, and undertook to define its powers and regulate its constitution. The principle of equality of representation and the unicameral form of organization were, however, continued; besides, its efficiency as a national legislature was impaired by other unwise provisions. It did not possess the power of taxation, nor did its commands operate upon individuals, but rather upon States which could not be coerced. A few years' experience showed that it was unequal to the task of a national legislature, and when the constitutional convention of 1787 came to deliberate upon the structure and powers of Congress it was practically unanimous in favor of the bicameral organization and of vesting Congress with more adequate powers. The troublesome question of representation was settled by an arrangement which protected the small States by giving them equality of representation in one chamber, and the large States by proportional representation in the other.

Congress was given adequate power over the source of the national revenue, besides other powers inherent in a national legislature. All its powers were enumerated by the Constitution, while a number of express prohibitions were inserted in behalf of individual liberty. Lest an express enumeration of its powers might operate to deprive it of discretion in choosing the appropriate means of carrying into execution the powers granted, a so-called 'elastic clause' was inserted empowering Congress to pass all laws deemed necessary and proper to carry out the powers expressed. Compared with the vast range of powers left with the States the few powers conferred upon Congress seem quite insignificant, and this disparity seems all the more noticeable when compared with the omnipotence of the British Parliament. But the apparently narrow powers vested in Congress have been rather broadly construed by the Supreme Court throughout the entire period of our national history. With the sanction of the court, sometimes under the stress of emergency, but more frequently in time of peace, Congress has steadily extended its powers in every direction, exercising functions which were probably never intended by the framers of the Constitution to be assumed by it. Thus under the simple power to lay and collect taxes (doubtless for revenue only) Congress has employed its power to destroy State bank currency, to encourage certain industries and destroy others, and to restrict commercial intercourse. In pursuance of the power to coin money and pay debts it has established national banks, issued bills of credit, and given the legal-tender quality to its treasury notes. Under the power to establish post offices and post roads it has made a Government monopoly of the entire postal service, established a money-order system, and provided for free delivery of mail in all cities and in many rural communities. Under the power to regulate foreign and interstate commerce it has regulated not only traffic, but telegraphic intercourse and navigation on inland rivers and canals. This power has been employed also for the purposes of prohibition, reciprocity, retaliation, and revenue. It has included the laying of embargoes, the enactment of non-intercourse and non-importation and quarantine laws, the dredging of harbors, the erection of lighthouses, beacons, buoys, etc. Likewise Congress, without express authority, has acquired foreign territory, erected it into States, and governed its inhabitants without their consent. It has made large grants of land to aid in the construction of railroads, passed laws to regulate and control Federal elections, governed rebellious States through military agency, conferred suffrage upon the negroes, and undertaken to secure for them equality of treatment in public places. During the controversy over Reconstruction it encroached seriously upon the sphere of the executive and the courts declined to interfere in the latter's behalf.

In reviewing the first century of the history of Congress and its place in our scheme of government, several criticisms are worthy of note. These are the invariable practice of choosing members from local districts, the short tenures of Representatives, the large and unwieldy size of the Lower House, the long interregnum between the time of the election and the organization of the Congress, the shortness of the second session, and the exclusion of the Cabinet from seats in either House.

State Government. The Constitution of the United States provides that all powers not delegated to the United States nor prohibited by it to the States are reserved to the States, respectively, or to the people. Those powers absolutely prohibited to the States are the conclusion of treaties, alliances, or confederations among themselves; the granting of letters of marque and reprisal; the coining of money; the issue of bills of credit; the making of anything but gold and silver a tender in payment of debts; the enactment of *ex post facto* laws, bills of attainder, or laws impairing the obligation of contracts; and granting of titles of nobility. Those prohibited except with the consent of Congress are the levying of duties on imports or exports, except such as may be absolutely necessary for executing inspection laws; the laying of tonnage duties; keeping troops or ships of war in time of peace; entering into agreements or compacts with other States or foreign powers, or engaging in war unless actually invaded or when the danger is such as not to admit of delay.

Upon examination it will be seen that the relation of the citizen to the State Government is far more close than with the National Government. Nearly the whole domain of civil and religious liberty, education, suffrage, domestic relations, marriage, business transactions, property, professions, trades, contract relations, administration of the criminal law, and many other social and business relationships come within the sphere of the State Government. The fundamental law of each State is embodied in a written constitution drawn up by a constituent convention and ratified in most cases by the electorate at the polls. The earlier constitutions were brief instruments containing little more than the law for the organization of the Government and the necessary safeguards for the protection of civil liberty, but the later ones are bulky documents containing a vast amount of matter which should properly appear in the statutes. In each of the States the legislative power is vested in the Legislature, consisting of a Senate and a House of Representatives, though in six States the latter chamber is styled 'the Assembly' and in three 'the House of Delegates.' Both Houses are chosen by popular vote and by the same electorate, although there are variations as to the mode of choice and tenure. Usually the districts from which Senators are chosen are larger than those from which Representatives are elected, and as a consequence the Lower House is a more numerous body. The Senates range in size from 17 members in Delaware to 51 in Illinois. Delaware has also the smallest House of Representatives, consisting of 35 members, while New Hampshire has the largest, with 390 members. The relative size of the two Houses in New York is 50 and 150 members, respectively, in Pennsylvania 50 and 201, in Massachusetts 40 and 240. The tenure of State Senators is usually longer than that of Representatives. In a majority of the States it is four years, the usual term of a Representative being two years. In many of the States provision is made for partial renewal of the Senate, usually by halves every second year. In a few States the qualifications for eligibility to the Senate are higher than those of the Lower House. The franchise for the election of the Legislature and of all elective State officers is regulated by the State constitutions and is universal manhood suffrage, except that in Massachusetts, Connecticut, and some of the Southern States educational tests are required, while in Wyoming, Utah, and Colorado women enjoy the suffrage equally with men. (For further details, see SUFFRAGE and REPRE-

SENTATION.) In all the States members of the Legislature receive salaries, which are the same for members of both Houses. The amount ranges from one dollar a day and mileage at 8 cents a mile in Rhode Island to $1,500 a year and mileage at ten cents a mile in New York. In most of the States the Constitution provides for biennial sessions of the Legislature. In Massachusetts, Connecticut, Rhode Island, New York, New Jersey, and South Carolina annual sessions are required. In most of the States the length of the session is left to the discretion of the Legislature, in others it is limited by constitutional provision. The powers of the Legislature relative to organization, procedure, adjournment privileges, etc., are similar to those of Congress. The executive power in each State is vested in the Governor, popularly elected for a term ranging from one year in Rhode Island to four years in nineteen States. In a majority of the States—32 in number—there is a Lieutenant-Governor, who succeeds to the Governorship in case of a vacancy. The Governor's salary ranges from $1500 in Rhode Island and $2000 in New Hampshire to $10,000 in New York and Pennsylvania. In a few States he is ineligible to succeed himself. His duties and powers include the execution of the laws, the furnishing of the Legislature with information at the beginning of its session, the calling of it together in extraordinary session, the appointment of certain officers, usually with the consent of the Senate, the granting of reprieves and pardons, the veto of legislative measures except in four States (see VETO), and the command of the militia. In several of the States where there has been a traditional fear of the executive power, the Governor's prerogatives are very narrow—he has no veto power and but little power of appointment. To aid the Governor in the administration there are in every State a number of executive departments, at the head of which are officers usually chosen at the same time, in the same manner, and for the same term as himself. These are the Secretary of State, the Treasurer, the Attorney-General, the Auditor or Comptroller, and the Superintendent of Public Instruction. whose duties are sufficiently indicated by their titles. Besides, there are frequently such officers as commissioners of railroads and of canals, insurance, agriculture, labor, immigration, charities, etc. In most States where such officers exist they are popularly elected, but in a few States they are chosen by the Legislature or appointed by the Governor. The position of the heads of the State executive departments is in no sense similar to that of the President's Cabinet. The Governor has little or no power of direction over them and their responsibility is to their constituencies.

In each State the judicial power is vested in a Supreme Court or Court of Appeal, one or more superior courts known by different names, and a series of local courts of various kinds. In several States the Supreme Court is such only in name, there being a court of last resort above it and usually known as Court of Appeals or Court of Errors and Appeals. This is the case in New York, New Jersey, and Kentucky. Texas has two Supreme Courts, one for civil and the other for criminal cases. The size of the Supreme Courts ranges from three justices in eighteen States to nine in one State. The salaries of members of the State Supreme Courts range from $2000 in Delaware to $8000 in Pennsylvania. Next below the Supreme Court are the superior courts, sometimes called circuit courts, having jurisdiction over a group of counties with the power to hear appeals from the lower courts. Usually there is also a county court, which is known by different names and which has a wide original jurisdiction in both civil and criminal matters and appellate jurisdiction over the decisions of the justices of the peace. These justices of the peace have original jurisdiction in minor civil and criminal cases, with power to impose fines, to commit to prison for short periods, and to bind over accused persons to await the action of the grand jury. In the towns and cities there is usually a separate class of municipal courts. (See MUNICIPAL GOVERNMENT.) There are also probate and chancery courts in some States. Formerly the State judges were generally appointed by the Governor or chosen by the Legislature, but now in a great majority of the States they are popularly elected. In six States the Supreme Justices are still elected by the Legislature; in eight they are appointed by the Governor with the consent of the Council or Senate. The early rule was good-behavior tenure, but now that rule prevails only in Massachusetts, Rhode Island, New Hampshire, and Delaware. Elsewhere the term varies from two years in Vermont to twenty-one in Pennsylvania.

LOCAL GOVERNMENT. Three general types of local government prevail in the United States. They are the town system in New England, the county system in the South, and the mixed system in New York, Pennsylvania, New Jersey, and a number of the North Central States. In the town system the sovereign local authority is the town meeting, or general assembly of all the qualified voters of the town. A regular annual session of this assembly is held in the spring, and extra sessions are held throughout the year as necessity requires. At the annual meeting, which is presided over by a 'moderator,' the town officers are elected, the local budget passed, and other matters of local interest decided upon. The principal town officers are a number of selectmen ranging from three to nine, who are the general managers of the town affairs; the town clerk, who is the keeper of the records; the treasurer; the tax assessors; the tax collector; the school committee, and a variety of minor officers such as constables, overseers of the poor, surveyors, fence-viewers, etc. Where the pure town system prevails the county plays but little part in local administration, and in some States like Rhode Island there are, strictly speaking, no county officers, the county being merely a judicial district without corporate personality.

In the Southern States, where the county type of local government prevails, conditions are reversed. There the county is the political unit, and the administration of all local matters, except educational and municipal affairs, is intrusted to county officers. The chief county authority is the board of county commissioners or supervisors, each member of which represents one of the magisterial districts into which the county is divided. There is no authority which corresponds to the New England town meeting.

Besides the commissioners, the chief county officers are the sheriff, the clerk, the commissioner of education, the coroner, the assessor, and sometimes a tax collector, although the collection of the taxes is a duty generally imposed upon the sheriff. The subdivisions of the county in some States are known as precincts, in others as townships; in Delaware, as hundreds; in Georgia, as militia districts; in Louisiana (where the counties are called parishes), as wards; in Maryland, as election districts; in Mississippi, as supervisor's districts, etc. In the Southern States they are mere judicial or election districts. In each is usually to be found one or more justices of the peace and their ministerial officers or constables, but the districts are in no sense political corporations.

The mixed system which originated in New York and Pennsylvania is a compromise between the two types described above. Here both the town and county elements exist, but are combined in different ratios. In New York the chief local authority is the board of supervisors, consisting of a representative chosen from each town in the county. In Pennsylvania it is a board of three commissioners elected from the county at large. The New York supervisor presides over the town administration, while the Pennsylvania commissioner is in no sense a township officer. In the mixed type, the town or township is a body corporate and politic. Each has its clerk, assessor, collector, commissioner of highways, justices of the peace, constable, etc. In New York there is an annual town meeting at which local officers are elected and matters of poor relief, taxes, schools, etc., attended to. In the pure Pennsylvania form the town meeting does not exist, town affairs being managed by a corps of officers elected by the people of the town. The New York, or supervisor type of local government, has been adopted in Michigan, Illinois, Wisconsin, Nebraska, New Jersey, and elsewhere. The Pennsylvania, or commissioner system, has been transplanted to Ohio, Indiana, Iowa, Kansas, and Missouri, and in a modified form to Minnesota and the Dakotas. For local government in the towns and cities, see MUNICIPAL GOVERNMENT.

FINANCES. The finances of the United States are characterized by rapid increase in magnitude of fiscal operations, and by the great facility with which revenues are secured, resulting in a general tendency for revenue to outstrip expenditures. While the Federal Government possesses the constitutional right to levy both direct and indirect taxes, the requirement that the former shall be apportioned among the States in proportion to population, and the popular hostility to direct taxation, have in effect practically confined the Federal Government to the field of indirect taxation. The principal sources of revenue are customs duties, which yielded in 1902, $254,444,708, and internal revenue (excise taxes) yielding $271,880,122. The principal sources of the internal revenue were: Spirits, $121,138,013; fermented liquors, $71,988,902; tobacco, $51,937,925. Receipts from the postal service amounting (1902) to $121,848,047 figure in the total revenues, which for 1902 were $684,326,280.

The most important items of expenditure are pensions, the post office, the army, the navy, and interest on the public debt. In 1902 the sum paid out in pensions was $138,488,560; the cost of the postal service was $125,896,531; the total of expenditures made by the War Department was $114,657,246; of the Navy Department $68,302,025. It must be remembered that part of the expenses of the War Department should not logically fall under that head, as, for example, expenses for improvement of rivers and harbors. The total of expenditures for 1902 was $593,038,903.

The interest-bearing debt of the United States was $931,070,340 on July 1, 1902. The debt which bears no interest, including United States notes, ($346,681,000) and certificates against gold and silver deposited in the treasury, etc., amounted to $1,226,259,245. Only a relatively small part of the non-interest bearing debt is to be regarded as net debt, since far the greater part is covered by cash in the treasury.

BUDGET. See the article BUDGET.

HISTORY. Down to the adoption of the Federal Constitution the finances of the Central Government were in an extremely chaotic condition. In 1775 the Continental Congress undertook to establish a Continental army and navy, but no power had been delegated to Congress to raise revenue by taxation to meet the attendant expenditures. Congress was therefore forced to rely upon the issue of bills of credit, the proceeds of loans, foreign and domestic, and requisitions upon the various States, which the latter could honor or not as they saw fit. From 1775 to 1783 it is estimated that the income of the Continental Treasury, estimated in specie, amounted to $65,863,825, of which about $37,800,000 was secured through the issue of bills of credit, $19,416,000 through loans, and $5,795,000 through requisitions upon the States. National credit sank so low that in 1781 the Continental bills of credit had fallen to one per cent. of their face value. It was practically impossible, during the greater part of the Revolutionary period, for Congress to borrow money at home or abroad; the foreign loans from France and Spain were rather in the nature of subsidies than of real loans.

Under the Articles of Confederation, the financial position of the Central Government was but little stronger. It was provided that the expenses of the National Government should be defrayed by taxes apportioned to the States in proportion to the value of land and improvements. Congress had power to emit bills of credit and to contract loans; but since the States levied the apportioned taxes according to their own discretion, there was no certainty that such loans could be repaid when due. By 1786 the credit of the Government had fallen so low that it was practically impossible to secure loans, while the proceeds of the apportioned taxes did not meet the running expenses of government. Efforts to amend the articles so as to make possible a national tax proved unavailing, owing to the provision that unanimous consent of the States should be necessary for amendment.

From this state of affairs the country was rescued by the adoption of the Federal Constitution, which gave Congress wide powers of taxation. By the act of July 4, 1789, import duties were levied; in the following year the national debt was reorganized and augmented by the assumption of the State debts incurred in the War for Independence. In 1791 the first national bank was organized to aid in placing the governmental finances on a sound footing. (See Bank, Banking.) As the tariff of 1789 did not furnish revenue enough to meet current expenses, including the interest on the public debt, Congress in 1791 laid an excise tax upon spirits, which was further extended in 1794 to cover a considerable number of articles. In 1798 a direct tax was levied upon lands, dwelling houses, and slaves. Both the excise and the direct taxes were unpopular and unproductive, yielding in all only $1,582,000 in 1801. The customs duties, on the other hand, increased from $4,399,000 in 1791 to $10,751,000 in 1801.

From 1801 to 1811 revenue largely exceeded expenditures, in spite of the repeal of the excise taxes in 1802. The national debt was reduced from $83,000,000 to $45,200,000. With the outbreak of the War of 1812, customs duties fell off with the ruin of commerce, while military expenditures made a heavy drain upon the national resources. Excise duties were repugnant to the principles of the Republican Party, then in power; accordingly it was necessary to finance the war chiefly by means of loans and the issue of treasury notes. Up to the end of 1814 $41,010,000 was borrowed; by February, 1815, $36,680,000 in treasury notes had been issued, of which, however, part was issued to pay off earlier issues, the largest amount outstanding being $17.619,000 in 1816. In 1813 a direct tax of $3,000,000 was levied, and in 1814 excise taxes were again imposed. These taxes were repealed in 1817 with the increase in customs revenue attendant upon the renewal of foreign commercial relations. From 1816 to 1835 revenue exceeded expenditures so far as practically to extinguish the national debt in the latter year. In 1836 and 1837 a surplus accumulated, which was distributed to the States in the guise of a loan in 1837, about $28,000,000 being disposed of in this way. An important item in the revenues of 1834-37 was the proceeds from the sale of public lands. From 1810 to 1830 the sales of public lands had yielded an annual income ranging from one to two millions; in 1834 the yield was about $15,000,000; 1835, $14,767,000; 1836, $24,877,000; 1837, $6,776,000.

The following table gives the receipts and expenditures for typical years from the adoption of the Constitution down to the Civil War:

YEARS	Total ordinary receipts	Expenditures
1792	$3,669,000	$8,269,000
1801	12,935,000	9,393,000
1811	14,422,000	8,178,000
1814	9,800,000	34,720,000
1816	47,677,000	31,196,000
1821	14,573,000	15,842,000
1831	28,526,000	15,237,000
1841	16,860,000	26,482,000
1850	43,592,000	40,948,000
1860	56,054,000	63,201,000

The years 1837-43 showed a series of deficits owing to decline in revenue through commercial depression, and increase in expenditures due chiefly to greater expense in managing Indian affairs and the undertaking of internal improvements. It became necessary to resort again to the issue of treasury notes and the sale of bonds. An increase in tariff rates in 1842 restored the balance and created a surplus, which was turned into a deficit by the expenses of the Mexican War. Between 1846 and 1851 the national debt increased from $15,550,00 to $68,304,000. By 1857 the debt had been reduced to $28,700,000. A new series of deficits began with 1858, which increased the indebtedness about $50,000,000 by 1860, when the Morrill tariff act restoring higher duties supplied revenue in excess of expenditures.

For finances of the Civil War and the subsequent period, see Debt, Public; Finance; Specie Payments, Suspension of; etc.

Money. By an act of March 4, 1900, the gold dollar weighing 25.8 grains was made the standard of value of the monetary system. The gold coins in common use, however, are the five, ten, and twenty dollar pieces. Silver dollars, half dollars, etc., are also coined and accepted as convenient mediums of exchange. Silver and gold certificates are issued by the Government, for the repayment of which a fund of $150,000,000 in gold has been established. For further particulars, see articles on Money, Coinage, etc.

Weights and Measures. The United States system of weights and measures is fully discussed in the general article on Weights and Measures.

Army. The first step toward the establishment of a military force under the control of the Continental Congress was taken June 15, 1775, when that body resolved that a general be appointed to command all the Continental forces raised or to be raised for the defense of American liberty, and unanimously elected George Washington.

One year later (June 13, 1776) the Continental Congress created a 'Board of War,' the germ of the modern War Department. The Revolution was a great war school for the crude but patriotic bands that rallied under Washington's standard, and the Regular Army of to-day rests upon the foundation then laid, after European methods. Thus the United States articles of war are copied from the British military code; the principles of discipline, drill, and accountability for property survive as they were prescribed by the aide-de-camp of Frederick the Great—Baron Steuben; while the French volunteer Baron du Portail became the first Chief of Engineers.

In September, 1776, the Continental Congress appointed a committee to confer with the general officers of the army with the view of creating a system of instruction which would furnish officers educated in the theory of military art and science. This was the origin of the Military Academy at West Point, which institution, however, was not formally established until 1802.

Notwithstanding Washington's wise counsel, that provision should be made for a permanent and well-equipped army, the close of the Revolution saw the seasoned veterans return to their farms and other civil avocations, and Congress, swayed by the arguments that "Standing armies in time of peace are inconsistent with the principles of republican government and dangerous to the liberties of a free people," that "the United States being remote from nations having peace establishments and by being always in a state of defense, on the plan of the confederation, which provides that every State shall always keep up a well regulated and disciplined militia," directed the discharge of "the troops now (May 26, 1784) ber of officers," no officer to remain in service above the rank of captain.

War with a civilized power was no sooner ended than the need of provision against Indian hostilities became apparent; the Articles of Confederation framed for protection against the greater danger were found ineffective in dealing with the lesser evil. The recommendations of Congress fell upon deaf ears; each State was busy with its own immediate affairs, and the Continental legislature was compelled (June 3, 1784) to augment its nucleus of 80 enlisted men by the enrollment and equipment of a small regiment of foot soldiers; later (October 20, 1786), a battalion of artillery was added, and so by degrees the nucleus of a national force was formed which in 1788 amounted to 595 men, commanded by Lieutenant-Colonel and Brevet Brigadier-General Josiah Harmar.

The establishment of a permanent land force for the national defense, otherwise known as the 'Regular Army,' legally dates from March, 1789, a few weeks before the inauguration of Washington as President under the Federal Constitution. The troops then in service already mentioned, now became the 'Regiment of Infantry' and 'Battalion of Artillery,' and eventually (1791) became known as the First Regiment of Infantry (Lieutenant-Colonel Harmar) and the Battalion of Artillery (Major Doughty), respectively.

GENERALS COMMANDING THE ARMY OF THE UNITED STATES FROM THE FOUNDING OF THE REPUBLIC

	From	To
George Washington*	1775	1783
Henry Knox*	1783	1784
Josiah Harmar‡	1788	1791
Arthur St. Clair*	1791	1796
James Wilkinson*	1796	1798
George Washington†	1798	1799
James Wilkinson‡	1800	1812
Henry Dearborn*	1812	1815
Jacob Brown*	1815	1828
Alexander Macomb*	1828	1841
Winfield Scott*	1841	1861
George B. McClellan*	1861	1862
Henry W. Halleck*	1862	1864
Ulysses S. Grant†	1864	1869
William T. Sherman†	1869	1883
Philip H. Sheridan†	1883	1888
John M. Schofield§	1888	1895
Nelson A. Miles§	1895	1903
S. B. M. Young§	1903	1903

*Major-general. †General. ‡Brigadier-general. Josiah Harmar was a lieutenant-colonel commandant and brigadier-general by brevet. § Lieutenant-general.

For more than one hundred years after that date, the army served as the strong right arm of the Government: now engaged in holding back the Indians from border settlements; exploring unknown wilds and planting the flag for the honor and glory of the young nation; protecting the hardy settler and the advance guard of science; standing between the peace-loving citizen and the murderous mob; and in five wars forming the back-bone of the great forces called out to meet the emergencies. Withal, the Regular Army performed these varied duties quietly but effectually. It produced Grant, Lee, Sherman, Sheridan, Thomas, Jackson, and a host of able commanders of less renown, but yet distin-

exhibiting, since the Spanish-Americ
unexampled capacity for the admir
civil affairs, assuming at a moment'
ties ranging in importance from tho
nor-General and Judge of the Supre
collector of customs and chief of pol
charging them with marked ability

THE STAFF. Next to the training
ment of the line and the selection c
leaders, the question of a general
received the attention of the Board o
value of the services of the foreign ofi
volunteers organized, drilled, and ii
army and aided materially in achiev
cess of the American operations had
pressed Washington, who upon the ev
his resuming the command of the
addressed the Secretary of War: '
an army, if a judicious choice is not
principal officers, and above all, of
staff, it can never be rectified ther
character then of the army would
the superstructure. The reputation
mander-in-chief would sink with it ai
try be involved in inextricable expe

The first general staff officers a
Washington upon assuming comma
bridge (1775) were an adjutant-ge
ratio Gates), a quartermaster-gener
Mifflin), and a commissary-gener
Trumbull). Under them from time t
ing the war were temporarily appoi
of the line as assistants. As far ba
the Continental Congress had "Resc
that it is essential to the promoti
pline in the American army and to t
tion of the various abuses which pr
various departments that an appo
made of inspectors general, agreeable
tice of the best disciplined Europe
The first practical result of this
shown in the selection of Baron St
may justly be considered the originat
that is admirable in the staff sys
United States army. Although he h
rank of lieutenant-general in the Prus
he did not hesitate to serve at first
teer, pending his appointment as in
eral with rank of major-general (Ma

At the close of the war Baron S
signed his commission, receiving the
Congress "for the great zeal and abili
discovered in the discharge of the sev
of his office," together with the gift
hilted sword.' Toward the close of hi
ben prepared a manual of "Regulatio
order and discipline of the troops of
States," and for governing the milit
mouth, N. H., 1794), still a model of

Although, from time to time during
can Revolution, suitable persons were
to perform staff duties, yet the existi
partments date their permanent est
as follows: Adjutant-general's, Marc
inspector-general's, March 3, 1813; j
cate-general's (Bureau of Military Just
July 5, 1884; quartermaster's, March
subsistence, April 14, 1818; medical,

1818; pay, April 24, 1816; engineers, March 11, 1779 (present 'corps of'), March 3, 1863; ordnance, May 14, 1812; signal (corps), March 3, 1863. The *Journal of the Continental Congress*, Washington's orders, and the Revised Statutes teem with interesting historical and biographical data relating to these staff departments for which space here is denied. Out of the crude measures of a great crisis has grown a governmental system which, if not perfect, has through its personnel accomplished wonders. The names of Steuben, Trumbull, Rush, Morgan, Bernard, Townsend, Meigs, Ingalls, Myer, Fry, and Weston are those of a few of the men who, in spite of imperfections of organization, of official dry-rot, and a false sense of security from perils that at times threaten the most favored nations, were equal to the emergency of war, and achieved great distinction in their several departments.

STATISTICS OF THE UNITED STATES ARMY, 1789-1902

	Strength of Army	
1789	1 reg't infantry, 1 bat. artillery............	840
1792	Indian border wars,...........................	5,120
1794	Peace establishment...........................	3,629
1801	" "	5,144
1807	" "	3,278
1810	" "	7,154
1812	War with Great Britain........................	11,831
1815	" " " "	9,413
1817-1821	Peace establishment...........................	9,980
1822-1832	" "	6,184
1833-1837	" "	7,198
1838-1842	Florida War...................................	12,259
1843-1846	Peace establishment...........................	8,613
1847	Mexican War...................................	17,812
1848	" "	30,890
1849-1855	Peace establishment...........................	10,320
1856-1861	" "	12,931
1862	Civil War.....................................	39,273
1863-1866	" "	43,332
1867	Peace establishment...........................	54,641
1868-1869	" "	52,922
1870	" "	37,313
1871	" "	35,353
1872-1874	" "	32,264
1875-1879	" "	27,489
1891	" "	27,390
1896	" "	26,955
1898	" "	63,000
1902	" "	100,000

IMPORTANT CAMPAIGNS AND EXPEDITIONS
in which the Army has taken part.

1790-95	War with Northwestern Indians.
1794	Whisky Insurrection (Pa.).
1806	Sabine expedition (La.).
1811-13	War with Western Indians.
1812	Seminole disturbances (Fla.).
1812-15	War with Great Britain.
1813-14	Creek Indian war (Ala.).
1817-18	Seminole War (Fla.).
1823	Blackfeet Indian campaign.
1827	Winnebago Indian expedition.
1832	Black Hawk War.
1835-42	Seminole War (Fla.).
1836-37	Creek Indian disturbances (Ala.).
1836-39	Cherokee disturbances.
1838-39	New York frontier disturbances.
1846-48	Mexican War.
1848	Cayuse Indian war (Ore.).
1849-61	Navajo Indian troubles (N. M.).
1849-61	Indian disturbances (Tex.).
1850	Pitt River expedition (Cal.).
1851-52	Yuma expedition (Cal.).
1851-56	Snake, Sioux, Yakima, Cheyenne, and Arapahoe Indian war.
1855-57	Seminole War (Fla.).
1857	Gila expedition (N. M.).
1857-58	Utah expedition.
1858	Puget Sound and other Indian troubles.
1858-59	Wichita (Ind. Ter.), Colorado River (Cal.), Pecos and Antelope Hills (Tex.), and Bear River (Utah) expeditions.
1859-60	Cortina troubles on Texas-Mexican border.
1860	Kiowa-Comanche (Ind. Ter.) and Carson Valley (Utah) expeditions.
1860-61	Navajo expedition (N. M.).
1861-86	Apache Indian war (Ariz. and N. M.).
1861-65	Civil War.
1862-67	Sioux War (Minn. and Dak.).
1863-69	Indian war (Kan., Neb., Colo., and Ind. Ter.).
1865-68	War with Northwestern Indians.
1865-66	Fenian raid (N. Y. and Canada).
1867-81	Campaigns against Indians and Mexican border disturbances.
1868-69	Canadian River expedition (N. M.).
1871	Yellowstone expedition.
1872-73	Modoc War.
1873	Yellowstone expedition.
1874-75	Indian campaign (Ind. Ter.), Sioux (Wyo. and Neb.), Black Hills (Dak.), and Big Horn (Wyo.) expeditions.
1875	Expedition against Indians (Nev.).
1876	Powder River expedition (Wyo. Ter.).
1876-77	Big Horn and Yellowstone expeditions (Wyo. and Mont.).
1876-79	War with Northern Indians.
1877	Labor strikes (Pa. and Md.).
1877	Nez Perces campaign.
1878	Bannock and Piute campaigns (Nev. and Ida.), and Ute Indian expedition (Colo.).
1879-84	Disturbances in Ind. and Okla. Ter., and Ute Indian campaign (Colo. and Utah).
1885	Chinese mining and labor troubles (Wyo. Ter.)
1890-91	Sioux Indian troubles (So. Dak.).
1891-93	Garcia troubles (Texas-Mexican border).
1892	Miners' disturbances (Idaho).
1894	Labor disturbances (Ill.), and labor strikes (Ill. to Pacific coast).
1898	War with Spain.
1899-1902	Philippine insurrection.
1900	China relief expedition.

MODERN ESTABLISHMENT. The war with Spain (1898) called public attention to some of the imperfections of the American military administration, and discussion of the shortcomings brought about a plan of reorganization unprecedented in the history of the Army. The Philippine insurrection, requiring the occupation of the archipelago at one time by a force of 65,000 men (regulars and volunteers), became in its turn an object lesson in the formation of a permanent military establishment suited to the new conditions. The regular force of 1897, expanded by Congress the following year to 63,000, was in 1899 reinforced by 35,000 volunteers, exceptionally efficient, as nearly all had seen service in Cuba and the Philippines, and were organized into regiments commanded by selected regular officers. During two years following these troops were incessantly engaged in fighting the Filipinos under the unfavorable conditions of climate, terrain, and the treacherous character of the enemy.

Official figures of the Adjutant-General's office show that from February 4, 1899, to April 30, 1902, there were 2,561 engagements, and in no case did United States troops surrender or retreat leaving their dead and wounded in the possession of the enemy. Up to July 16, 1902, 4,135 officers and 123,803 men were landed in the Philippines, 1,135 officers and 23,000 men having been sent there more than once. The average strength during the period named was 40,000. The casualties were: Killed and died of wounds, 69 officers and 936 enlisted men; deaths from disease, 47 officers and 2,535 men; deaths from accident, 6 officers and 125 men; drowned, 6 officers and 257 enlisted men; deaths by suicide, 10 officers and 72 enlisted men; murdered, 1 officer and 91 enlisted men. Total deaths, 139 officers and 4,016 enlisted men; wounded, 190 officers and 2,707 enlisted men, a total of 2,897.

Besides the service in the Philippines, the regular contingent there was drawn upon for the China Relief Expedition to the extent of 2,000 men. During the short campaign—July-August, 1900—the American casualties numbered 32 killed and 77 wounded. For the first time since the Revolution the United States Army fought side by side with European troops, and the professional benefit derived from the association was well worth the cost. In certain respects the practical excellence of the American troops was conceded.

On February 2, 1901, Congress authorized a permanent increase of the Army (discretionary with the President except artillery) not to exceed 100,000 men, including 12,000 native troops for service in Porto Rico and the Philippines. This force consisted of 15 regiments of cavalry, 30 of infantry, one of engineers, a corps of artillery, and the staff departments. In June of that year all volunteers were mustered out. In July, 1902, the President, in the exercise of the discretion vested in him by law, the United States having recognized the independence of Cuba and having placed the greater part of the Philippine Islands under civil government, materially reduced the army to the aggregate strength shown in the following table:

lected from the fourteen colonels), with his station at the headquarters of the Army, and consisting of 126 companies of coast artillery and 30 batteries of field artillery. These were grouped within a number of artillery districts, and each district placed under command of a competent field officer.

RELATIVE STRENGTH OF ARMY TO POPULATION*

Year	Officers	Men	Total	Per cent.
1790	57	1216	1273	$\frac{3}{100}$ of 1
1800	318	4118	4436	$\frac{8}{100}$ of 1
1810	774	9147	9921	$\frac{14}{100}$ of 1
1820	712	8230	8942	$\frac{9}{100}$ of 1
1830	627	5324	5951	$\frac{5}{100}$ of 1
1840	733	9837	10570	$\frac{6}{100}$ of 1
1850	948	9815	10763	$\frac{5}{100}$ of 1
1860	1108	12259	13367	$\frac{4}{100}$ of 1
1870	2541	34534	37075	$\frac{10}{100}$ of 1
1880	2152	24357	26509	$\frac{5}{100}$ of 1
1890	2168	24921	27089	$\frac{4}{100}$ of 1
1900	2500	65000	67500	$\frac{9}{100}$ of 1

*Records, Adjutant-General's Office.

ORGANIZATION OF THE UNITED STATES ARMY, JULY, 1902

	Lieut.-general	Major-generals	Brig.-generals	Com. officers	Non-com. staff officers	Non.-com. officers	Bands	Privates	Total commissioned	Total enlisted	Aggregate
General officers	1	6	15	....	....	....	....	....	22	....	22
Adjutant-general's department	...	1	...	27	....	....	....	....	28	....	28
Inspector-general's department	...	...	1	16	....	....	....	....	17	....	17
Judge adv.-general's department	...	...	1	11	....	....	....	....	12	....	12
Quartermaster's department	...	...	1	96	150	....	....	....	97	150	247
Subsistence department	...	...	1	43	200	....	....	....	44	200	244
Medical department	...	...	1	320	500	....	....	2,100	321	2,600	2,921
Pay department	...	...	1	52	....	....	....	....	53	....	53
Corps of Engineers	...	...	1	159	8	288	28	992	160	1,316	1,476
Ordnance department	...	...	1	71	....	....	....	....	72	....	72
Signal Corps	...	...	1	34	....	350	....	460	35	810	845
Record and Pension Office	...	...	1	1	....	....	....	....	2	....	2
Chaplains	...	...	...	62	....	....	....	....	62	....	62
15 regiments cavalry	...	...	...	750	120	2,880	420	10,620	750	14,040	14,790
Veterinarians	...	...	...	....	....	....	....	....	....	....	30
126 companies coast artillery	...	...	...	531	48	2,772	280	10,962	531	14,062	14,593
30 batteries field artillery	...	...	...	120	....	630	....	3,050	120	3,680	3,800
30 regiments infantry	...	...	...	1,500	240	6,480	840	22,320	1,500	29,880	31,380
Military Academy	...	...	...	....	....	....	....	....	....	342	342
Enlisted men unattached to Reg's, etc.	...	...	...	....	....	....	....	....	....	800	800
Indian scouts	...	...	...	....	....	....	....	....	....	75	75
Philippine scouts	...	...	...	....	....	....	....	....	....	....	....
Porto Rico provisional reg. of infantry	...	...	...	31	6	184	....	648	31	866	897
Grand aggregate	1	7	25	3,824	1,272	13,584	1,568	51,152	3,857	68,821	72,708

The most radical change in the organization was that of the artillery. For many years, nominally it was regimental, but practically the unit for administration and operation was the battery. The system of coast defense lacked cohesion, consisting simply of a number of independent posts commanded by officers, who, having reached the rank of field officer after thirty or forty years' service, as light battery commanders in the Civil War, or with infantry garrisons in peace, were content to rest on their laurels. Under the influence of Secretary of War Root, the seven regiments of artillery (after a long struggle, professional and political) were merged into a corps, supervised by a chief (se-

At the same time, a plan of instruction for young officers was devised—an elaboration of the post-graduate schools existing at the opening of the war with Spain—and the following institutions were created: A War College at Washington, a General Service and Staff College at Fort Leavenworth, a Cavalry and Light Artillery School at Fort Riley, an Engineer School at Washington Barracks, and a School of Submarine Defense at Fort Totten, N. Y. A large appropriation was made in 1902 for permanent camp grounds and the erection of additional barracks and quarters at certain military posts, at which large garrisons may be concentrated. See ARMIES; ARMY ORGANIZATION; and other military topics where matters pertaining to the United States Army are discussed. For militia, see section under the various States.

Navy. The first definite provision for a naval establishment was the act of Congress of October 13, 1775, which authorized the building of one vessel of 10 guns and another of 14 guns to be equipped as national cruisers. At the same time a law was passed establishing a marine committee consisting of John Adams (later replaced by Christopher Gadsden), John Langdon, and Silas Deane. This Congressional committee was later enlarged to thirteen and given charge of all matters pertaining to the navy.

On October 30th two more vessels were authorized, one of 20 and the other of 36 guns; while on December 13th the construction of thirteen ships was provided for. On November 10th an act for the 'public defense' authorized the raising of two battalions of marines and established rules for the "government of the American Navy." The marines authorized were in reality sailors, for the act provided "that particular care be taken that no persons be appointed to offices, or enlisted into said battalions, but such as are good seamen, or so acquainted with maritime affairs as to be able to serve to advantage by sea when required." It is probable, therefore, that Congress designed by the act to provide crews for such vessels as they were able to equip and to enlist and keep the men together until their services could be made available.

As the vessels authorized to be built could not be completed for some time, a number of merchantmen were purchased and armed. These improvised men-of-war, hastily and poorly equipped and armed, and in many cases very badly officered and manned, constituted the first American naval force, of which, by act of Congress of December 22, 1775, Esek Hopkins was made commander-in-chief.

The vessels of the improvised navy were directed to cruise along the coast and intercept transports laden with munitions of war for the British army and navy. On February 17, 1776, a squadron under Commander-in-Chief Hopkins consisting of the *Alfred, Columbus, Cabot, Andrea Doria, Providence, Wasp, Fly,* and *Hornet* put to sea bound for the West Indies. The *Fly* and *Hornet* parted company with the fleet on the night of the 18th, but the remainder kept together, and in March captured the British naval station on the island of New Providence, Bahamas, obtaining a quantity of military and naval stores, including nearly 100 cannon, which were much needed for arming the new ships. The squadron left on March 17th, having on board the royal Governor and some other prisoners. When off Long Island, Hopkins captured a British bomb-brig of 8 guns and a tender of 6 guns and had a running fight with H. B. M. S. *Glasgow* of 20 tons, which made a very good defense and eventually, by good management, escaped. In October, 1776, Congress passed a vote of censure upon Commodore Hopkins for not performing the duties upon which he was sent. He was dropped from the service on January 2, 1777, and no other officer has since been given the title of commander-in-chief of the Navy.

On March 23, 1776, letters of marque and reprisal were granted against Great Britain, and numerous privateers were fitted out. On June 25th a marine corps (q.v.) was established consisting of one major, nine captains, ten first lieutenants, and seven second lieutenants.

After the Declaration of Independence Congress began the building up of the navy with increased vigor, and on October 3d it ordered another frigate and two cutters, and on November 9th an act was passed authorizing the construction of three 74-gun ships, five more frigates, a sloop-of-war, and a packet; and these were to be supplemented by another frigate and another sloop-of-war ordered in January, 1777. But the plans of Congress were quite beyond the capacity of the Colonies either to build, equip, or man. One 74 was laid down at Portsmouth, N. H., and completed in 1781—too late to be of service. Her armament was reduced to 56 guns, and during the next year she was presented to the King of France to replace the 74-gun ship *Magnifique*, which was lost in Boston Harbor. Many of the vessels built never got to sea, and the real work performed by the navy during the Revolution was done by a dozen vessels, most of which were small.

On November 15, 1776, Congress established the relative rank between officers of the army and navy as follows: Admirals to rank with generals, vice-admirals with lieutenant-generals, rear-admirals with major-generals, commodores with brigadier-generals, captains of ships of 40 guns and upward with colonels, captains of ships of 20 to 40 guns with lieutenant-colonels, captains of ships of 10 to 20 guns with majors, lieutenants with captains, and officers of marines with officers holding similar commissions in the land service. Notwithstanding this act, no rank higher than that of captain was created by law until 1862, though the title of admiral (q.v.) was given to John Paul Jones in the official correspondence of the State Department in 1792, a short time previous to his death.

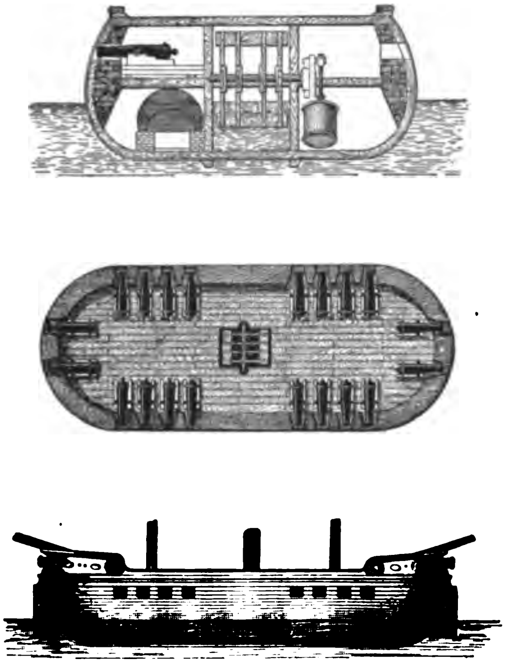
From the close of the Revolution until 1795 the country was practically without a navy, largely from lack of money to support one. The cause of its reëstablishment was the depredations of the Barbary pirates. On March 3, 1794, President Washington sent a message to Congress communicating the facts in regard to the Algerian outrages, and Congress promptly passed an act, which was approved on March 27th, authorizing the purchase or construction of six frigates. It was provided that no vessel should mount less than 32 guns. An additional provision was that all proceedings under the act should cease in case the Algerian difficulty should be settled. Measures were immediately taken for the construction of the vessels, which consisted of the *Constitution* (q.v.), *President*, and *United States* of 44 guns, and the *Chesapeake* (q.v.), *Constellation*, and *Congress* of 38.

In November, 1795, a treaty was signed with the Dey of Algiers, and all work on the vessels was suspended. The President immediately called the attention of Congress to the subject, and an act was passed without delay ordering the completion and equipment of two of the 44's and one of the 38's. The treaty of peace with the Dey of Algiers cost nearly a million dollars, the price of three frigates, and the President, in his annual address to Congress in December, 1796, strongly recommended laws for the gradual increase of the navy. The outrageous proceedings of the French cruisers on the United States coast did what no representations of the Government could achieve, and in April, 1798, Congress grudgingly authorized the President to build, purchase, or hire twelve vessels, none of which was to exceed 22 guns, and see that they were regularly manned and equipped. This act was passed on April 27th, and on the 30th a regular Navy Department was created separate from the Department of War, of which it had previously formed a part. Benjamin Stoddert of Georgetown, D. C., was the first Secretary, and he entered on his duties in June. On June 11th a new marine corps was established, and during the year a number of additional small vessels were authorized.

The quasi-war with France soon terminated with credit to the newly born service; nevertheless, it is probable that Congress was so deeply imbued with false ideas of economy that the navy would have been reduced to comparative uselessness had not the Barbary powers repeated their acts of aggression. At the close of the operations against Tripoli, which were highly creditable to the navy, the service was in excellent condition. The spirit of economy shown by our Government now took a new turn. President Jefferson, whose knowledge of military affairs was very slight and of naval affairs practically *nil*, brought forth his gunboat policy. While this system was being developed the incident of the *Chesapeake* and *Leopard* occurred and saved the navy from absolute disorganization, though that incident itself was discreditable to the country and the naval service. Neither the aggressions of England and France nor the danger of war with Spain were sufficient, however, to cause Congress to appropriate money for ships of the line, and the navy at the beginning of the War of 1812 was possessed of nothing larger than a frigate, while the price of several line-of-battle ships had been squandered in building more than 200 worthless gunboats. The operations of the War of 1812 were so extensive and important that they cannot here even be separately mentioned. Suffice it to say that the navy achieved world-wide renown and won the respect of the country.

Immediately after the close of the war with Great Britain a squadron under the command of Commodore Decatur was sent to punish the Barbary powers, particularly Algiers, for wanton aggressions upon our commerce during the war, which prevented action being taken at the time. In sixty days after his arrival in the Mediterranean Decatur had captured the principal vessels of the Algerian navy and had forced treaties on Algiers and Tunis which compelled these faithless pirates to a recognition of maritime right.

In considering the operations of the War of 1812 it is interesting to speculate upon what might have occurred had the war lasted another year. In 1813 Robert Fulton submitted to President Madison plans for a sea-going steam battery. His plans were accepted, and in March, 1814, Congress authorized the building of one or more of such batteries for the defense of the coast. Fulton died in February, 1815, but the *Demologos* (Voice of the People) was completed in the following spring and had successful trials in June. On July 4, 1815, she made a trip to sea and back, steaming 53 miles in eight hours and twenty minutes. Her length was 156 feet, beam 56 feet, depth 20 feet, and she measured 2475 tons, or more than a line-of-battle ship and 1000 tons more than the *Constitution*, although her cost, $320,000, was only $17,000 more than the first cost of the latter. Her sides were 5 feet thick and impenetrable to any guns carried by British ships, while her battery consisted of 20 guns, which were heavier than any then afloat. A furnace was fitted for heating shot, and there were pumps for throwing cold or hot water on the enemy's deck. The propelling apparatus of the *Demologos* consisted of a single paddle-wheel in the centre of the ship, operating in a channel extending the length of the ship below the gun deck and dividing the under-water body into two parts, which were held together by the upper works and transverse frames at the bottom. Had this vessel got to sea before the conclusion of hostilities and met the warships of the enemy it is tolerably certain that she would have destroyed the heaviest squadrons with ease and caused a revolution in naval affairs. As it was, however, her powers remained unproved and the natural conservatism of the naval authorities, accustomed to the use of sails, caused her to be looked upon as an interesting experiment of no great practical value. She was, therefore, tied up alongside the wharf at the Brooklyn Navy Yard and used as a receiving ship. On June 4, 1829, her magazine blew up, killing 24 persons and injuring 19.



THE DEMOLOGOS.

The successful performance of the *Demologos* (or *Fulton*, as she was afterwards called in tely. But the conservative officers at the head of affairs in the navy could not understand the importance of steam-propelled ships, and it was not until 1835 that measures were taken to carry out the provisions of the law. In the meantime a number of ships of the line were built, about a dozen in all, and some of them took part later in the Mexican War. In 1835 the Secretary of the Navy, acting upon better advice, directed the Board of Commissioners to proceed at once to the construction of a steam man-of-war. In 1837 the vessel was completed and tried, a speed of 12 knots being realized. Her propelling power consisted of side paddle-wheels and engines on the upper deck. Several other paddle-wheel vessels were built in the next few years, one of which was the iron steamer *Michigan*, which is still in service on the Great Lakes—the first iron vessel in the navy, and also the first one afloat on the Lakes. In 1842-43 the screw steamer *Princeton* (of about 1000 tons) was built and fitted with machinery designed by John Ericsson. She was the first war vessel in any navy to be fitted with screw propulsion, and likewise the first to have all her machinery and boilers below the water-line and to have blowing fans for forcing the draught under the boilers. A Congressional committee, after considering the advantages of the submerged propeller and iron hulls, recommended in 1846 that thirteen screw steamers of iron be immediately constructed. When authority for the construction of four war steamers was granted in the following year, a board of prominent naval officers recommended that three of the four should have paddle-wheels. The fourth was the *San Jacinto;* and it as well as the others was built of wood. In 1854 Congress ordered the building of "six first-class steam frigates to be provided with screw propellers." These vessels were the celebrated ships of the *Merrimac, Niagara,* and *Wabash* class. They were of fine model for their day, and should have had good speed, but instead of having full steam and auxiliary sail power they had full sail power and only auxiliary engines. They were followed, however, in 1857 by the steam frigates of the *Hartford* class, in which the engine power was relatively considerably increased.

The operations of the navy in the Civil War soon showed the true importance of steam and the uselessness, or worse than uselessness, of sails. Even after the close of the war the practice of giving full sail power to our cruising men-of-war was continued from mistaken ideas of economy; though during the war the rigged ships had been very generally stripped of yards and upper masts. The practice died hard, and it was not until 1887 that a full sail rig was abandoned for cruising vessels. The ill-fated *Maine* was the last ship for general service to be designed to carry a heavy square rig, but this was changed to military masts before her completion.

The importance of possessing armored vessels was realized as soon as the Civil War commenced, and on both sides an investigation of the subject of armored ships was begun at once. The Confederates started work first, but the superior resources of the North enabled the first really

gina) were fatally defective in details, but many of the defects were corrected in later vessels of the same types. See SHIP, ARMORED.

After the close of the Civil War the navy again sank into decadence, the enormous expenses entailed by the war causing Congress to cut down appropriations in every direction. The personnel of the regular service was increased just after the end of the struggle, but it was cut down later, the last cut being in 1882, just as new construction was about to commence. During the interval 1866-82 only a few vessels were authorized—five monitors of 4000 to 6000 tons and about a dozen wooden cruisers, only one of which (the *Trenton*) was over 2000 tons. Old vessels were repaired and kept going, but nothing new was attempted, the wooden cruisers mentioned being out of date when put in service. So that, in 1880, the United States Navy, with its antiquated ships and no less antiquated ordnance, was the laughing-stock of the world and in power below that of several of the small republics of South America. Finally, in 1881, a board was appointed by the Secretary of the Navy to consider the needs of the service. This board recommended the building of sixty-eight vessels of various types.

Congress appropriated for two and at its next session increased the number to four, but reduced the size. The first of these acts was passed August 5, 1882, and in addition to the provision for the two ships made a sweeping cut in the number of officers which blocked promotion for ten years and subsequently caused endless trouble through the deficiencies in the numbers produced by it. Five monitors were started early in the 'seventies,' but work on them had long since ceased when it was revived by the act of 1882 which appropriated $400,000 toward their completion. In the next session $1,000,000 additional was appropriated, but the succeeding Congress withdrew all unexpended balances of this. From this time on each Congress made some addition to the navy. In 1886 the *Maine* and *Texas* were provided for and in 1890 three battleships of the *Oregon* type. In deference to the very general prejudice which existed against the high-sided, broadside battleships of European navies, these ships were given rather low freeboard and were called 'coast-line battleships.' But the *Iowa*, which was next built, was frankly described as a seagoing battleship, the unreasoning prejudice in favor of the nearly useless low free-board monitor having been much modified.

The war with Spain caused increased attention to be given to naval affairs, not only because the navy had done well, but because the people were beginning to appreciate the importance of a powerful navy to a country which must be attacked from the sea and reach its enemies through its naval strength. They learned not only this, but that true naval defense lies not in passive protection of harbors by forts and harbor-defense ships, but in pursuing the enemy's naval forces at sea and destroying them. The realization of these things caused the navy to be considerably expanded; more heavy battleships, armored cruisers, and torpedo boats were authorized; and the enlisted force, which had been nearly doubled since 1882, was now greatly increased. In

1899, for the first time in nearly twenty years, Congress passed legislation of importance concerning the officers. Nearly all corps were slightly increased and the line and engineer corps were combined. This was practicable, as nearly all officers of both corps had been educated at the Naval Academy, and, while the line officers had received considerable instruction in steam engineering, the engineers had received some training in line officers' duties. The desirability of the 'amalgamation' of the corps is yet to be determined.

The organization of the Department of the Navy is described under Navy, Department of the.

The active list of officers of the navy in May, 1902, consisted of 1299 commissioned officers, 868 cadets, mates, and warrant officers, and 200 officers of marines. The retired list consisted of 475 commissioned officers (many of whom are performing active duty on shore), 116 warrant officers (a few of whom are employed on active duty), and 27 marine officers. The enlisted force authorized was 22,500 petty officers and men, 2500 naval apprentices, and 6000 marines. The commissioned officers included 874 officers of the line (which includes engineers), 190 of the medical corps, 136 of the pay corps, 41 constructors, 21 civil engineers, 24 chaplains, 12 professors of mathematics, and 1 secretary to the admiral. There were 124 naval cadets at sea, 301 cadets at the Naval Academy, 95 boatswains, 91 gunners, 69 carpenters, 9 sailmakers, 148 warrant machinists, 25 pharmacists, and 6 mates.

The enlisted force of the navy is divided into five branches—seaman, artificer, special, messman, and marine. The first three have assimilated ratings which are classified in each branch under the heads of: (a) chief petty officers; (b) petty officers, first class; (c) petty officers, second class; (d) petty officers, third class; (e) seamen, first class; seamen, second class; seamen, third class. The chief petty officers of the seaman branch are chief master-at-arms (pay per month, $65), chief boatswain's mate ($50), chief gunner's mate ($50), chief gun-captain ($50), chief quartermaster ($50); in the artificer branch there are chief machinist ($70), chief electrician ($60), chief carpenter's mate ($50); in the special branch, chief commissary steward ($70), chief yeoman ($60), hospital steward ($60), commissary steward ($60), bandmaster ($52). Petty officers of the first class consist of boatswain's mates, first class, master-at-arms, first class, machinists, first class, etc., with rates of pay from $36 to $60 per month. Petty officers of the second class consist of master-at-arms, second class, machinist, second class, etc., with pay ranging from $35 to $40. Petty officers of the third class consist of master-at-arms, third class, etc., pay $30 per month in all cases. The seamen, first class, consist of seamen gunners ($26), seamen ($24), apprentices, first class ($21), firemen, first class ($35), and musicians, first class ($32). The seamen, second class, consist of ordinary seamen ($19), apprentices, second class ($15), firemen, second class ($30), shipwrights ($25), musicians, second class ($30), buglers ($30), hospital apprentices ($20). The seamen, third class, consist of landsmen ($16), apprentices, third class ($9), and coal passers ($22). In the messmen branch, officers' stewards are paid $24 to $45 and their cooks $20 to $40. Ship's cooks (for the crew) are paid $25 to $55 and bakers $35 to $45. Officers' mess attendants are paid $16 to $24. In the enlisted force of the marine corps, sergeant-majors are paid $34 to $42; other sergeants, $18 to $42; drum major, $25 to $33; corporals, $15 to $23; drummers, trumpeters, and privates, $13 to $21; leader of the band, $125 to $175; second leader of the band, $75 to $83; musicians, first class, $60; musicians, second class, $50. All men not petty officers are given an outfit of clothing upon enlisting for the first time and marines of all ratings are given an ample allowance of clothing throughout their enlistment. The mess expenses of enlisted men are met by an allowance of a ration of 30 cents a day in addition to the rates of pay.

Officers of the navy who have creditable records are retired at the age of 62 years on three-fourths the pay received at date of retirement. Officers retired for disability or incapacity may receive three-fourths pay, half pay, or furlough pay (about one-third full pay). Marine officers, as well as army officers, are retired for age at 64 years. Enlisted men are pensioned for disability or retired after thirty years' service on three-fourths the highest rate of pay received.

The vessels of the United States navy in 1902 were 305 in number, the more important of which are grouped together in the tabular statement in the article Navies.

The United States possesses a number of naval stations, both at home and in its outlying territories and possessions. Of these, 6 are navy yards of the first class, located at New York, Norfolk, Mare Island (near San Francisco), Boston, Philadelphia, and Port Orchard (Puget Sound); 3 navy yards of the second class, located at Portsmouth (N. H.), Pensacola (Fla.), and New Orleans (La.); 4 of the third class, located at Port Royal (S. C.), Charleston (S. C.)—this will be an important yard when completed—San Juan (Porto Rico), Cavité (P. I.); 3 of the fourth class, located at Key West, Pollok (Mindanao, P. I.), and Isabela Basilan (P. I.); 2 training stations, located at Newport and Yerba Buena Island (San Francisco Bay); 1 naval academy at Annapolis; 1 torpedo station, at Newport; 1 gun factory at Washington; 1 ordnance proving ground, at Indian Head (near Washington); 5 coaling stations located at New London, Tortugas (near Key West), Hawaii (navy yard to be established), Guam, and Tutuila (Samoa).

Colonies. The following figures for area and population are based upon the census of 1900 and Government estimates:

COLONIES	Area	Population
Hawaii	6,740	153,727
Philippine Islands	127,853	6,975,073
Porto Rico	3,676	953,243
Guam	195	9,000
Tutuila	54	3,800
Total for the colonies	138,518	8,094,843

The following table shows the trade relations between the United States and what are now its principal dependent territories, for the fiscal years 1893 and 1903:

COLONIES	Exports to		Imports from	
	1893	1903	1893	1903
Hawaii	$2,717,338	$10,787,666	$9,146,767	$26,201,175
Philippine Islands	154,378	4,028,677	9,159,857	11,372,584
Porto Rico	2,510,607	11,976,134	4,008,623	10,909,147
Totals	$5,382,323	$26,792,477	$22,315,247	$48,482,906

For details on commerce, government, history, etc., see HAWAII, PHILIPPINE ISLANDS, and PORTO RICO.

POPULATION. The population of the United States constitutes over one-half that of the Western Hemisphere and greatly exceeds that of any European country except Russia. The rapidity of the growth of the population is without parallel among civilized nations. In 1900 it was over fourteen times greater than in 1800. During the same period the population of the United Kingdom and the German Empire increased about two and one-half times each, while that of France increased by less than half. The growth of the population also has been remarkably steady. Except in the war decade, 1860-70, the increase in each decade since 1790 has been greater than in the decade preceding.

The following table shows the growth of the population by sections—the North as compared with the South and the East with the West:

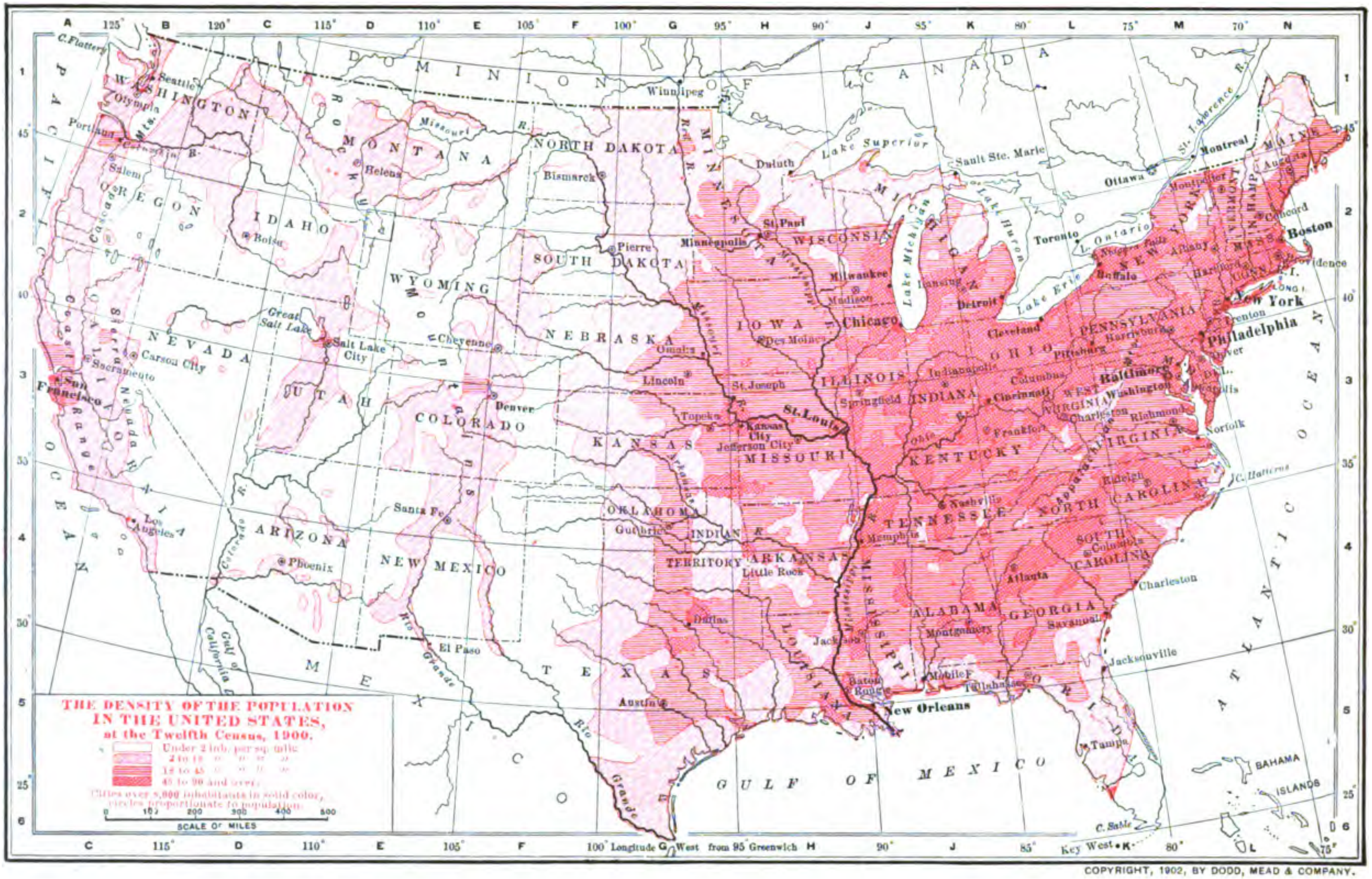
CENSUS	POPULATION			
	North Atlantic and North Central divisions	South Atlantic and South Central divisions	East of the Mississippi River	West of the Mississippi River
1900	47,379,699	24,523,527	55,023,513	20,971,062
1890	39,763,824	19,830,813	46,160,075	16,462,175
1880	31,871,518	16,516,568	38,896,423	11,259,360
1860	19,690,984	11,133,361	26,906,846	4,536,475
1840	10,112,624	6,950,729	16,186,554	876,799
1820	5,219,221	4,419,232	9,404,187	234,266
1800	2,686,582	2,621,901	5,308,483	....

It will be seen that the North has, until recent years, grown much more rapidly in population than the South. The more rapid growth of the South in the last decade was largely due to the development in the southwest. The gain in the region east of the Mississippi has been remarkably regular. The percentage of gain west of the Mississippi was formerly enormous, but is rapidly falling to that of the region east of the Mississippi. The percentage of gain of the former region in 1890-1900 was 25 and in the latter 19.2.

A considerable part of the country is losing in population. In the decade 1880-1890, 14.7 per cent. of the area of the North Atlantic and North Central States decreased in number of inhabitants, and in the following decade 19.5 per cent. of the same area represented a loss. In the South Atlantic and South Central States the percentage of area which lost population in the respective decades was 9.0 and 5.1. Of the region east of the Mississippi 17.8 per cent. lost population in the decade 1880-90, and 10.6 per cent. in the following decade. The corresponding percentages for the region west of the Mississippi were 10.1 and 11.1, respectively.

Estimates of the population prior to the first regular census place the figure at 200,000 in 1688 and 1,850,000 in 1770. At the time of the first census the population was almost wholly confined to the Atlantic coast region, the five most populous States being Virginia, Pennsylvania, North Carolina, Massachusetts, and New York, in the order named. The growth of the country has involved an enormous migration of peoples. This movement may be considered as twofold: first, an interstate migration of native Americans; second, foreign immigration.

INTERSTATE MIGRATION. In the early period of migration the direction of the movement was determined largely by the opportunities afforded by waterways and mountain passes, and, later, by the railroad accommodations. The waterway system of the United States was admirably adapted to aid in the settlement, and the part it played is not easily over-emphasized. Not only did many of the early settlers secure transportation to their new homes by rivers, but they used the rivers also as avenues of commerce, and new settlements almost universally began along watercourses. In the North the immigrants from New England and New York passed almost wholly through the Mohawk Valley, and western New York developed rapidly along the line of the Erie Canal. By this route the Lake region and the Northwest in general were peopled. Farther to the south a large number of settlers found passage west by way of the valley of the Potomac, and by the Ohio and its tributaries. The settlements made in the region tributary to the Ohio were first to the south and later to the north of that stream. In the Southeast the Savannah and other rivers in like manner aided in opening up the interior region. The influence of streams in the Mississippi Valley was very marked. Through the main stream from the south, and through the Ohio from the east, large numbers of immigrants passed to the centre of the valley and thus were enabled to reach other regions watered by the Mississippi system, until settlements lined the main and tributary streams. The railroads came at an opportune time and made possible and profitable the settlement of regions that would otherwise have remained unsettled for a much longer time. The gold discoveries in California drew large numbers of immigrants in spite of the difficulties of the route, but, generally speaking, the Pacific Coast and the Cordilleran region awaited the construction of railroads. The movement of the population in the United States has been in the main westward, following the parallels of latitude. Almost every newly settled region, however, received representatives from all parts of the older settled regions, and there are a few very marked north and south movements. Thus, for instance, southern and central Indiana were filled largely with immigrants from North Carolina, Kentucky, and other Southern States. The early lead-miners and settlers in the adjacent corners of Wisconsin and Illinois on the Mississippi were Southerners. The recently settled Oklahoma and Indian Territory received large numbers



THE DENSITY OF THE POPULATION IN THE UNITED STATES, at the Twelfth Census, 1900.

COPYRIGHT, 1902, BY DODD, MEAD & COMPANY.

from both the North and the South. As the West became well settled the westward movement grew less important; whereas in 1880 11 per cent. of the population of the Central States were born in the Atlantic Coast States, in 1900 only 6 per cent. of the population in the former group of States were born in the latter group. Again, in 1880 13.5 per cent. of the population of the Western division of States were born in the Atlantic States; in 1900 the corresponding per cent. was only 9.5. The absolute number, however, had increased during the period. The increase was much more marked in the percentage of the Central States population which the Western division of States contained. The rate increased from 17.5 per cent. of the population in 1880 to 24.0 per cent. in 1900. In the latter year there were 954,974 whites and 336,879 negroes born in the Southern States who lived in the North and 1,021,450 persons born in the North who lived in the South. New York and Ohio have each experienced a net loss of between six and seven hundred thousand by interstate migration of native born. Texas has made a net gain of 629,000.

NEGRO POPULATION. See NEGRO IN AMERICA.

URBAN POPULATION. From 1875 to 1900 there developed a marked tendency for the population of the United States to segregate in cities. Better transportation and communication facilities have enabled trade to concentrate in the large centres, and the development of an extensive factory system has also tended in the same direction. At the same time the greater use of farm machinery has reduced the amount of labor necessary on the farm. The following table shows the absolute and relative increase in the different classes of urban and rural population. It is noteworthy that while the percentage of increase of the urban population was almost as great in the decade 1890-1900 as in the preceding decade, there was in every class of cities but one (the group 4000 to 8000) a very much less percentage of gain in the latter of the two decades:

NUMBER AND POPULATION OF CITIES CLASSIFIED BY SIZE, AND POPULATION OF COUNTRY DISTI

	Number of cities			Population			Per cent total populat	
	1900	1890	1880	1900	1890*	1880	1900	1890
Cities having a population of 100,000 and over	38	28	20	14,208,347	9,697,960	6,241,240	18.7	15.5
25,000 to 100,000	122	96	57	5,509,965	4,291,608	2,394,284	7.3	6.8
8,000 to 25,000	385	321	210	5,273,887	4,255,057	2,753,137	6.9	6.8
4,000 to 8,000	612	447	328	3,380,193	2,449,299	1,796,241	4.4	3.9
2,500 to 4,000	704	598	473	2,211,019	1,865,443	1,485,964	2.9	3.0
Country districts				45,411,164	40,388,347	35,484,917	59.8	64.2
Continental U. S				75,994,575	62,947,714	50,155,783	100.0	100.0
All cities	1,861	1,490	1.088	30,583,411	22,559,367	14,670,866	40.2	35.8

*Includes population of Indian Territory and Indian reservations.

The North Atlantic and the North Central States contain the great majority of the urban population. In 1900 the North Atlantic States had 16 and the North Central States 14 of the 38 cities having over 100,000 inhabitants each, while the former division had 54 and the latter 35 of the 122 cities with a population between 25,000 and 100,000.

The following table sho
cities having over 100,00C
for the census years 1860,

POPULA

CITY	
New York	3,
Chicago	1,
Philadelphia	1,
Brooklyn	
Saint Louis	
Boston	
Baltimore	
Cleveland	
Buffalo	
San Francisco	
Cincinnati	
Pittsburg	
New Orleans	
Detroit	
Milwaukee	
Washington	
Newark	
Jersey City	
Louisville	
Minneapolis	
Providence	1
Indianapolis	1
Kansas City, Mo	1
Saint Paul	1
Rochester	1
Denver	1
Toledo	1
Allegheny	1
Columbus	1
Worcester	1
Syracuse	1
New Haven	1
Paterson	1
Fall River	1
Saint Joseph	1
Omaha	1
Los Angeles	1
Memphis	1
Scranton	1

*The city of Brooklyn was co
City in 1898.

DENSITY. There were in
the square mile in the Uni
about 600 persons in Eng
Germany, and about 53
Russia. The average dens
the United States is grea
of the vast uninhabited
ern half of its territory.
such as Massachusetts or
sity compares favorably wi
European countries, as sho
table:

POPULATION

STATES AND TERRITORIES	Land area sq. mi.	1850	1890[1]	1900[2]	Negroes 1900	Foreign born, 1900	Density per sq. mi. 1900
North Atlantic Division:							
Maine	29,895	583,169	661,086	694,466	1,319	93,330	23.2
New Hampshire	9,005	317,976	376,530	411,588	662	88,107	45.7
Vermont	9,135	314,120	332,422	343,641	826	44,747	37.6
Massachusetts	8,040	994,514	2,238,943	2,805,346	31,974	846,324	348.9
Rhode Island	1,053	147,545	345,506	428,556	9,092	134,519	407.0
Connecticut	4,845	370,792	746,258	908,420	15,226	238,210	187.5
New York	47,620	3,097,394	5,997,853	7,268,894	99,232	1,900,425	152.6
New Jersey	7,525	489,555	1,444,933	1,883,669	69,844	431,884	250.3
Pennsylvania	44,985	2,311,786	5,258,014	6,302,115	156,845	985,250	140.1
Total North Atlantic Division	162,103	8,626,851	17,401,545	21,046,695	385,020	4,762,796	129.8
South Atlantic Division:							
Delaware	1,960	91,532	168,493	184,735	30,697	13,810	94.3
Maryland	9,860	583,034	1,042,390	1,188,044	235,064	93,934	120.5
District of Columbia	60	51,687	230,392	278,718	86,702	20,119	4,645.3
Virginia	40,125	1,421,661	1,655,980	1,854,184	660,722	19,461	46.2
West Virginia	24,645	....	762,794	958,800	43,499	22,451	38.9
North Carolina	48,580	869,039	1,617,947	1,893,810	624,469	4,492	39.0
South Carolina	30,170	668,507	1,151,149	1,340,316	782,321	5,528	44.4
Georgia	58,980	906,185	1,837,353	2,216,331	1,034,813	12,403	37.6
Florida	54,240	87,445	391,422	528,542	230,730	23,832	9.7
Total South Atlantic Division	268,620	4,679,090	8,857,920	10,443,480	3,729,017	216,030	38.9
North Central Division:							
Ohio	40,760	1,980,329	3,672,316	4,157,545	96,901	458,734	102.0
Indiana	35,910	988,416	2,192,404	2,516,462	57,505	142,121	70.1
Illinois	56,000	851,470	3,826,351	4,821,550	85,078	966,747	86.1
Michigan	57,430	397,654	2,093,889	2,420,982	15,816	541,653	42.2
Wisconsin	54,450	305,391	1,686,880	2,069,042	2,542	515,971	38.0
Minnesota	79,205	6,077	1,301,826	1,751,394	4,959	505,318	22.1
Iowa	55,475	192,214	1,911,896	2,231,853	12,693	305,920	40.2
Missouri	68,735	682,044	2,679,184	3,106,665	161,234	216,379	45.2
North Dakota	70,195	....	182,719	319,146	286	113,091	4.5
South Dakota	76,850	....	328,808	401,570	465	88,508	5.2
Nebraska	76,840	....	1,058,910	1,066,300	6,269	177,347	13.9
Kansas	81,700	....	1,427,096	1,470,495	52,003	126,685	18.0
Total North Central Division	753,550	5,403,595	22,362,279	26,333,004	495,751	4,158,474	34.9
South Central Division:							
Kentucky	40,000	982,405	1,858,635	2,147,174	284,706	50,249	53.7
Tennessee	41,750	1,002,717	1,767,518	2,020,616	480,243	17,746	48.4
Alabama	51,540	771,623	1,513,017	1,828,697	827,307	14,592	35.5
Mississippi	46,340	606,526	1,289,600	1,551,270	907,630	7,981	33.5
Louisiana	45,420	517,762	1,118,587	1,381,625	650,804	52,903	30.4
Texas	262,290	212,592	2,235,523	3,048,710	620,722	179,357	11.6
Indian Territory	31,000	....	180,182	392,060	36,853	4,858	12.6
Oklahoma	38,830	....	61,834	398,331	18,831	15,680	10.3
Arkansas	53,045	209,897	1,128,179	1,311,564	366,856	14,289	24.7
Total South Central Division	610,215	4,303,522	11,153,075	14,080,047	4,193,952	357,655	23.1
Western Division:							
Montana	145,310	....	132,159	243,329	1,523	67,067	1.7
Wyoming	97,575	....	60,705	92,531	940	17,415	0.9
Colorado	103,645	....	412,198	539,700	8,570	91,155	5.2
New Mexico	122,460	61,547	153,593	195,310	1,610	13,625	1.6
Arizona	112,920	....	59,620	122,931	1,848	24,233	1.1
Utah	82,190	11,380	207,905	276,749	672	53,777	3 4
Nevada	109,740	....	45,761	42,335	134	10,093	0.4
Idaho	84,290	....	84,385	161,772	293	24,604	1.9
Washington	66,880	....	349,390	518,103	2,514	111,364	7.7
Oregon	94,560	13,294	313,767	413,536	1,105	65,748	4.4
California	155,980	92,597	1,208,130	1,485,053	11,045	367,240	9.5
Total Western Division	1,175,550	178,818	3,027,613	4,091,349	30,254	846,321	3.5
Total United States (proper)	2,970,038	23,191,876	62,802,432	75,994,575	8,833,994	10,341,276	25.6
Alaska	590,884	....	....	63,592	....	....	....
Total	3,560,922	....	....	76,058,167	....	....	....
Colonies	138,518	....	....	8,094,843	....	....	....
Grand Total	3,699,440	....	....	84,153,019	....	....	....

1890[1] figures include Indians in Indian Territory, but not those on other reservations.
1900[2] figures do not include 91,219 persons in military and naval service.

SEX. The population contrasts with that of most European countries in that the males outnumber the females. The excess is greatly increased because of the greater number of male than of female immigrants.

In the North Atlantic and the South Atlantic States the sexes are almost equal in number. In some of these States, such as Massachusetts, the females are much in excess of the males, amounting in the State named to 51.3 per cent. of the total population. This is in part due to the large immigration of girls for work in the factories of that State, and in part to the emigration of men to the West. There is no State in the other divisions of States in which the females are equal in number to the males, and in the three States Montana, Wyoming, and Nevada the females are less than 40 per cent. of the total, while in Alaska they constitute only 27.9 per cent. of the total population. The following table shows the proportion of the sexes by nativity and color in 1900:

NATIVITY AND COLOR	Males	Females
Native white—native parents	20,934,099	20,119,318
Native white—foreign parents	7,869,089	7,818,233
Foreign white	5,545,819	4,704,230
Negro	4,393,221	4,447,568
Chinese	111,054	7,996
Japanese	71,400	14,600
Indian	134,560	132,200
Total	39,059,242	37,244,145

OCCUPATIONS. The agricultural industry still continues well in the lead with respect to the number of persons engaged. There has been, however, a marked relative decrease since 1880, as will be seen in the table below. In the period 1880-1900 there was a larger absolute gain in the number engaged in trade and transportation, and in manufacturing and mechanical pursuits, respectively, than there was in agriculture. The increase in trade and transportation has been especially noteworthy. The number of females engaged in occupations more than doubled in the twenty-year period. The percentage of females engaged in domestic personal service decreased, while there was a large gain in the percentage engaged in trade and transportation. The following table shows the number and percentage of persons engaged in the different occupations in 1880 and 1900. The group 'manufacturing and mechanical pursuits' includes those engaged in fishing (16,177 in 1900), and mining and quarrying (581,221), in addition to the number engaged in those pursuits (6,436,594). The number engaged in mining and quarrying much more than doubled between 1880 and 1900.

	Mainland			
	1900		1880	
	Number	Per cent.	Number	Per cent.
Both sexes; all occupations	29,074,117	100.0	17,392,099	100.0
Agricultural pursuits	10,381,765	35.7	7,713,875	44.3
Professional service	1,258,739	4.3	603,202	3.5
Domestic and personal service	5,580,657	19.2	3,423,815	19.7
Trade and transportation	4,766,964	16.4	1,866,481	10.7
Manufacturing and mechanical pursuits	7,085,992	24.4	3,784,726	21.8
Males; all occupations	23,754,205	100.0	14,744,942	100.0
Agricultural pursuits	9,404,429	39.6	7,119,365	48.3
Professional service	828,163	3.5	425,947	2.9
Domestic and personal service	3,485,208	14.7	2,242,309	15.2
Trade and transportation	4,263,617	17.9	1,803,629	12.2
Manufacturing and mechanical pursuits	5,772,788	24.3	3,153,692	21.4
Females; all occupations	5,319,912	100.0	2,647,157	100.0
Agricultural pursuits	977,336	18.4	594,510	22.5
Professional service	430,576	8.1	177,255	6.7
Domestic and personal service	2,095,449	39.4	1,181,506	44.6
Trade and transportation	503,347	9.4	62,852	2.4
Manufacturing and mechanical pursuits	1,313,204	24.7	631,034	23.8

LANGUAGE. In 1900 there were 1,403.212 persons over 10 years of age who could not speak English, considerably over half of them being females. The majority, 1,217,280, belonged to the census group 'foreign white,' constituting 12.2 per cent. of the total number of persons in this class. Only 0.6 per cent. of the native whites of foreign parents could not speak English. There were 38.2 per cent. of the Chinese, 61.6 per cent. of the Japanese, and 42.3 per cent. of the Indians who could not speak English.

IMMIGRATION. For a general discussion of immigration and its problems, see article on IMMIGRATION. The statistics given here are based upon the report of the Commissioner-General of Immigration for the fiscal year ending June 30, 1903.

The number of immigrants for 1903 (857,046) exceeded that of any previous year by 105,043, and represented an increase over 1902 of 190,517. Italy and Austria-Hungary, it will be seen, contributed more than one-half of the total from Europe. The aliens debarred during the year numbered 8769, or 1.2 per cent., a percentage greater than for any preceding year, with the exception of 1898 and 1899. Paupers and contract laborers constituted the greater part of the number rejected.

The following table shows the principal races represented, and the number each contributed to the sum total of steerage immigrants:

Italian (north and south)	233,546
Polish	82,343
Scandinavian	79,347
Hebrew	76,203
German	71,782
Irish	35,366
Slovak	34,427
Croatian and Slavonian	32,907
English	28,451
Magyar	27,124
All others	155,550
Total	857,046

Of the total number (857,046) 102,431 were less than fourteen years of age; 714,053 were between the ages of fourteen and forty-five; while 40,562 were forty-five years of age and upward. Of all the immigrants 3341 could read but not write, and 185,667 could neither read nor write.

The following table shows the total number and sex of the immigrants and aliens who arrived during the fiscal year ending June 30, 1903, and the countries from which they came:

COUNTRIES	Sex of immigrants		Total immigrants (steerage)	Other alien passengers	Grand total
	Males	Females			
Austria-Hungary	147,984	58,027	206,011	3,282	209,293
Belgium	2,308	1,142	3,450	603	4,053
Denmark	4,554	2,604	7,158	654	7,812
France, including Corsica	3,513	2,065	5,578	4,243	9,821
German Empire	24,861	15,225	40,086	10,936	51,022
Greece	13,634	456	14,090	231	14,321
Italy, including Sicily and Sardinia	186,966	43,656	230,622	4,930	235,552
Netherlands	2,499	1,499	3,998	715	4,713
Norway	16,249	8,212	24,461	646	25,107
Portugal, including the Cape Verde Islands and the Azores	5,829	3,488	9,317	154	9,471
Rumania	5,313	3,997	9,310	201	9,511
Russian Empire (with Finland)	92,935	43,158	136,093	2,237	138,330
Servia, Bulgaria, and Montenegro	1,699	62	1,761	33	1,794
Spain, including Canary and Balearic Islands	1,733	347	2,080	1,139	3,219
Sweden	29,808	16,220	46,028	1,306	47,334
Switzerland	2,796	1,187	3,983	1,039	5,022
Turkey in Europe	1,453	76	1,529	108	1,637
United Kingdom:					
England	15,593	10,626	26,219	16,433	42,652
Ireland	15,966	19,344	35,310	3,165	38,475
Scotland	3,953	2,190	6,143	3,174	9,317
Wales	835	440	1,275	241	1,516
Europe not specified	3	2	5	....	5
Total Europe	580,484	234,023	814,507	55,470	869,977
China	2,167	42	2,209	108	2,317
Japan	15,909	4,059	19,968	195	20,163
India	79	15	94	95	189
Turkey in Asia	5,114	2,004	7,118	387	7,505
Elsewhere in Asia	507	70	577	2	579
Total Asia	23,776	6,190	29,966	787	30,753
Africa	121	55	176	197	373
Australia, Tasmania, and New Zealand	796	354	1,150	405	1,555
Philippine Islands	123	9	132	4	136
Pacific Islands not specified	58	9	67	9	76
British North America	728	330	1,058	2,370	3,428
British Honduras	54	27	81	98	179
Elsewhere in Central America	423	174	597	397	994
Mexico	416	112	528	476	1,004
South America	405	184	589	618	1,207
West Indies	5,743	2,427	8,170	3,436	11,606
All other countries	19	6	25	2	27
Total countries outside Europe and Asia	8,886	3,687	12,573	8,012	20,585
Grand total	613,146	243,900	857,046	64,269	921,315

RELIGION—THE COLONIAL PERIOD. The religious life of the United States has been profoundly affected by the fact that the period of the early settlement of this continent coincided with the great religious struggles in Europe of the seventeenth century. It was the reform within the Catholic Church, following the great Protestant schism, that started the Orders of that Church on their proselyting crusades, which from New Spain in the Southwest and New France in the North, extended into territory now embraced within the United States. The divisions among the Protestants themselves resulted in the planting of most of the English colonies, and determined that their future development should be along the line of multiplicity of sects, with extreme local independence. Puritanism, within and without the Established Church, was the prevailing influence among these colonists. In Virginia its influence was overthrown soon after the Cavalier immigration of the Cromwellian era. Maryland, settled under Catholic leadership, always retained a dominant Puritan element in its population. The same was true of the Carolinas, and later of Georgia, although, as in almost all the Southern colonies, the official class belonged to the Church of England. In New England for more than half a century the Puritans, outside of Rhode Island, constituted a veritable theocracy, in which citizenship was synonymous with church membership. Those settlers who passed from New England to the other colonies usually bore with them a modified form of Puritanism, which reappeared in the early Presbyterian development of the middle colonies, and in the Baptist development farther south. The religious influence of the early Dutch settlers of New York was never very strong, and before the colony passed into English control it was known as a most mixed sectarian centre. In New Jersey and Pennsylvania the Quaker element, although early abdicating political control, continued to be the leading social factor.

Throughout the colonial period the Puritans exercised almost undisputed religious sway in New England, while members of the Established Church nominally did the same for the Southern colonies. In the middle colonies no one sect acquired a hegemony. Here the diversified English sects were quickly joined by Huguenots from France, Palatines, Salzburgers, and Moravians from Germany, Covenanters from Scotland, and the Scotch-Irish Presbyterians. To a much more limited extent many of these immigrants settled in the Carolinas and Georgia, but their chief irruption into the South was by the way of the

Appalachian highlands. In this early sectarian diversity the middle colonies, more than those of any other section, were most typical of the succeeding development of the whole country. During the first century and a quarter of settlement there was naturally little of common religious experiences in the colonies. Some conscientious attempts were made to convert the Indians, of which the most important was the work of 'The President and Society for the Propagation of the Gospel in New England.' The 'Society for the Propagation of the Gospel in Foreign Parts,' a Church of England organization, founded in 1701, did an important work in the middle and southern colonies. The most important religious experience of the eighteenth century was the 'Great Awakening,' centring about 1740, which profoundly affected all of the colonies, led to an extension of church-building, the founding of Princeton College as the result of a great Presbyterian development in the middle colonies, and the firm establishment of Baptist preëminence in the South. Because of some unwise practices not wholly avoidable, dissensions were introduced among the existing sects, yet the movement as a whole was most beneficial, not merely because it stamped upon American church life a strong evangelistic and missionary character, but because it led the way to the later establishment of full religious toleration. The later part of the colonial period was characterized by the rapid development of Presbyterianism, the formal establishment of the Reformed and Lutheran churches among the Germans, and the beginning of Methodism—all within the middle and southern colonies. See CONGREGATIONALISM.

THE NATIONAL PERIOD. The Revolutionary War, although it ushered in an era of complete religious toleration, so far as State and nation were concerned, was not on the whole favorable to the development of the religious life of the newly created States. By the end of the century, when spiritual conditions were at their lowest ebb, the country experienced a second great revival, which if it lacked some of the fervid manifestations of the first, was much more productive of lasting results. As in the former case there came about a secession of some of the more radical elements from the existing denominations in the Middle States and the South, and the severance of the Unitarians and Universalists from the traditional Congregational school in New England. Yet in the main the first three decades of the nineteenth century may be termed the 'era of good feeling' in a religious as well as a political sense. It was a period of great catholicity among the various denominations, with coöperation in foreign and home missionary work, in educational advancement, and in the work of Bible distribution. This was the period also when the Episcopal and Catholic churches began to develop along American lines and to assume an important position among American denominations; the latter being recruited most largely from foreign immigration, and the former from the other denominations. The great missionary movement toward foreign lands, the home missionary movement along the Western national border, the building of theological seminaries, the work among the negroes and Indians, protests against slavery, and the first movements in favor of total abstinence also date from this period. Early in the nineteenth century the last of the State aids in favor of New England Congregationalism was withdrawn.

The next thirty years (1830-1860) were characterized by a more intense denominational alignment, showing itself in a withdrawal of the separate churches from organizations for united effort, and in the creation of various denominational boards to carry on this work; in a new zeal for Church history along sectarian lines; in a general Protestant antipathy to the Catholic Church, which even displayed itself in the political world (see KNOW-NOTHING), and in the division of some of the great denominations along sectional lines, especially over the great slavery question. The religious element was especially helpful on both sides during the Civil War, and was much in evidence in the organization of associations for the care of soldiers at the front and also at the North for the education of the freedmen. Only one of the great denominations severed by the slavery issue has as yet been reunited, but there is a feeling of cordiality, and to some extent of coöperation, between the separate parts of these sects.

An important revival, just preceding the Civil War, had stirred deeply the evangelical sentiment of all the churches, and this was quickened by a succeeding revival between 1870 and 1880. The influence of these movements has been much in favor of a sincere and hearty coöperation of all denominations in favor of fundamental religious work. While there has been no tendency toward a dropping of creeds, ceremonial forms, or denominational tenets, there has been a distinct advance in essential Christian union. This tendency has been much strengthened by such organizations as the Evangelical Association, the Young Men's Christian Association, and the various young people's organizations that have sprung up during the last two decades. (See CHRISTIAN ENDEAVOR; EPWORTH LEAGUE; WESTMINSTER LEAGUE; YOUNG MEN'S CHRISTIAN ASSOCIATION.) An interesting feature of the religious development of the last half-century has been the growth of certain non-orthodox sects. See MORMONS; CHRISTIAN SCIENCE.

Owing to the fact that Church and State are entirely distinct in the United States, it is difficult to obtain accurate information concerning religious statistics. The only figures available are those derived from the annuals and year books published by the several denominations. The accompanying table is intended to show the status of the leading religious sects of the United States for the years 1890 and 1900, and thus furnish a means of determining their growth or decline during this period. The figures supplied by the Roman Catholic Church included as members all persons who had been baptized, irrespective of age, and in order to place this denomination on the same footing as the others, a deduction of 15 per cent. from these returns has been made, with the idea of excluding from the membership all children under ten years of age. It was impossible to get exact figures for the Mormons, Christian Scientists, and Unitarians, and an estimate based upon the most reliable authorities has been made. In the case of the Jews, the number of families rather than the individual membership must be given.

DENOMINATIONS	Ministers		Churches		Members		Gain
	1890	1900	1890	1900	1890	1900	Per cent.
Adventists:							
Seventh Day	284	372	995	1,470	28,991	55,316	91.0
Baptists:							
Regular (North)	6,685	7,415	7,907	9,374	800,450	973,820	21.5
Regular (South)	8,957	12,058	16,238	18,963	1,280,066	1,608,413	25.5
Regular (Colored)	5,468	14,351	12,533	15,654	1,348,989	1,864,600	38.0
Seventh Day	115	119	106	115	9,143	8,991	—1.5
Free Will	1,493	1,619	1,304	1,486	87,898	85,109	—3.0
Catholics, Roman	9,166	11,636	10,245	12,062	6,242,267	8,610,226	38.0
Christians	1,435	1,248	1,424	1,520	103,722	111,835	8.0
Christian Scientists	26	12,000	221	600	8,724	1,000,000	......
Congregationalists	5,058	5,614	4,868	5,604	512,771	629,874	23.0
Disciples of Christ	3,773	6,528	7,246	10,528	871,017	1,149,982	32.0
Dunkards:							
German Baptists	1,622	2,612	729	850	61,101	95,000	55.0
Episcopalians:							
Protestant Episcopalians	4,146	4,961	5,019	6,686	532,054	716,431	34.5
Evangelical Bodies:							
Evangelical Association	1,235	1,052	2,310	1,806	133,313	118,865	—11.0
Friends: Orthodox	1,113	1,279	794	820	80,655	91,868	14.0
German Evangelical Synod	680	909	870	1,129	187,432	203,574	8.5
Jews	200	301	533	570	130,496	211,627	......
Latter Day Saints:							
Mormons	543	1,700	425	796	144,352	300,000	110.0
Reorganized Church	1,500	2,200	431	600	21,773	45,500	109.0
Lutherans:							
All Divisions	4,591	6,710	8,595	11,123	1,231,072	1,665,878	35.0
Methodists:							
Methodist Episcopal	15,423	17,521	22,844	26,021	2,240,354	2,716,437	21.0
Methodist Episcopal (South)	4,801	6,041	12,688	14,244	1,209,976	1,457,864	20.5
Methodist Episcopal (African)	3,821	5,659	4,124	5,775	452,725	673,504	48.0
African Zion	1,555	3,125	1,587	2,906	349,788	536,271	5.3
Presbyterians:							
Presbyterians (North)	5,934	7,335	6,717	7,469	788,224	973,433	23.5
Cumberland Presbyterians	1,861	1,734	2,791	2,957	164,940	180,192	9.0
Presbyterians (South)	1,129	1,461	2,391	2,959	179,721	225,890	33.5
Reformed:							
Dutch	558	698	572	619	92,970	107,594	15 5
German	880	1,082	1,510	1,660	204,018	243,545	19 0
Salvation Army	....	2,689	329	753	8,742	40,000	350.0
United Brethren in Christ	2,267	1,897	3,731	4,229	202,474	243,841	20.0
Unitarians	515	550	421	459	67,749	71,000	5.0
Universalists	708	735	956	764	49,194	48,426	—1.5

The large increase in the number of Christian Scientists is especially noteworthy. The Seventh Day Adventists, Mormons, the Salvation Army, and German Baptists also show an appreciable gain. The strongest denominations numerically are the Roman Catholics, Methodists, Baptists, Presbyterians, and Lutherans, in the order named. Details and latest statistics regarding the various denominations may be found under their respective headings.

The distribution of the several sects has largely followed the historic lines of immigration. The Roman Catholics are numerically the strongest in more than half the States, including New England, the far Northwest, and the Pacific divisions; while the Methodists and Baptists are about equally divided in the States south of Mason and Dixon's line. Massachusetts is the leading State of the Congregationalists, New York of the Episcopalians, Pennsylvania of the Presbyterians, North Carolina of the Methodists, and Georgia of the Baptists. See the articles on the various denominations.

EDUCATION. This topic is fully treated under the following headings: NATIONAL EDUCATION, SYSTEMS OF; SCHOOLS; PUBLIC SCHOOLS; COMMON SCHOOLS; GRAMMAR SCHOOLS; EVENING SCHOOLS; UNIVERSITIES; etc.

CHARITIES. The National Government has no department concerned directly with charities, their control being in the hands of the State and municipal governments. Many private organizations and societies are also interested in the subject. See under the several State articles; also the articles on CHARITIES; PAUPERISM; CHARITIES AND CORRECTION, THE NATIONAL CONFERENCE OF; CHARITY ORGANIZATION SOCIETY; etc.

HISTORY. COLONIAL PERIOD. The territory included within the United States of America was originally occupied solely by numerous tribes of Indians. The Northeastern coast was probably visited about the year A.D. 1000 and subsequently by the Northmen (see VINELAND), and other navigators may in the following five centuries have sighted parts of the coast; but the existence of the American continent was unknown to the world at large until after Columbus's discovery in 1492. In 1497 John Cabot reached the coast of America, probably in the neighborhood of Cape Breton. The Portuguese Cortereal explored the coast southward from the Gulf of Saint Lawrence in 1500-01, and probably from as early a date as 1504 fishermen from Normandy and Brittany frequented the shores of Newfoundland. In 1513 Juan Ponce de Leon explored a portion of Florida in a romantic search for the fountain of youth; and in 1520 some Spanish vessels from Santo Domingo were driven upon the coast of Carolina. During the following year, through the conquests of Cortés (q.v.) and his followers, Mexico, including the territory later known as Texas, New Mexico, and California, became a province of Spain. In the same decade Verrazano explored the coast between North Carolina and Newfoundland and Narvaez made his disastrous expedition to Florida. Ferdinand de Soto in 1539-42 led a Spanish expedition from the coast of Florida westward, discovering the Mississippi River (April, 1541). Simultaneously with this expedition, Coronado's men explored a great part of what is now the Southwestern United States. A Spanish settlement was made at Saint Augustine, Florida, in 1565; and in 1584-85 Sir Walter Ralegh (q.v.) sent two expeditions to the coast of North Carolina, and attempted to form a settlement on Roanoke Island. None of the settlements attempted during the sixteenth century, however, except Saint Augustine, had any permanence; and it was not until the seventeenth century that the Europeans, and especially the English, devoted their enterprises to colonization rather than to exploration. King James in 1606 granted a charter to a large colonizing corporation which comprised two companies, the London Company, which received certain rights between 34° and 41° north latitude, and the Plymouth Company, which received certain rights between 38° and 45°. The London Company in 1607 founded Jamestown, Virginia, the first permanent English settlement within the limits of the present United States. Here in 1619 a representative assembly was called, the first in the New World. In 1607, also, two members of the Plymouth Company, Sir Ferdinand Gorges and Sir John Popham, sent out an expedition to the Kennebec, where the settlers experienced a severe winter, and in 1608 abandoned the undertaking. In 1620 certain dissenters who had secured a grant from the London Company landed by mistake farther northward and settled Plymouth. Between these two colonies the Dutch had already established themselves (1613) at New Amsterdam. Quebec was settled in 1608, and a large part of the country on the Great Lakes and on the Mississippi was explored by Nicolet (1634), by Marquette and Joliet (1673), and by La Salle (1682), and settlements were early made by the French at the outposts of Kaskaskia and Arkansas Post, and at Mobile and Vincennes. Thus the beginnings were made of two distinct movements of the incoming population, in the course of one of which the English were to occupy practically the entire Atlantic seaboard of the present United States, excluding Florida, while in the course of the other the French were to establish themselves at strategic points on the two great waterways. The colonizing work of the French was such as to make conspicuous the trading post, the military element, and the bureaucratic class, and to minimize the features of public development, of local political life, and of permanence in method and purpose. The English, on the other hand, brought with them their school, their Church, and their political forms, and founded colonies on lines which were adhered to throughout their later development. (The early history of the various colonies, the union of which formed the United States, will be found under the heads of the different States.) In some of the colonies representative governments were maintained, in which all officers, both executive and judicial, as well as the entire legislature, were chosen by the people. On the other hand, in the royal provinces, such as Virginia and New York, the chief judicial and executive officers, as well as members of the upper branch of the legislature, were appointees of the Crown, the general population sharing in the provincial government only through the choice of the members of the legislature. This distribution of privilege characterized also the proprietary provinces, such as Maryland, in which, however, appointments were made by the proprietors instead of by the Crown. Thus in the royal and proprietary provinces the ultimate authority was outside of the province, while in charter provinces all authority apparently was within each province, and there was in the scheme by which these provinces were organized no effective means of subordinating their political actions to the power of the central administration except through the alteration or abolition of their charters.

During the colonial period there were several instances of the tendency of the colonies, having very similar institutions and ideals, to act jointly as a confederate body. The first effort at a union of colonies was in 1643, when Massachusetts Bay, Plymouth, Connecticut, and New Haven formed, under the title of 'The United Colonies of New England,' a confederacy, which existed for nearly forty years, for mutual defense against the French, Dutch, and Indians. They also experienced the benefit of united action during the early Indian wars, and again in 1754, the year of the opening of the French and Indian War (q.v.). At that time also, the colonies being strongly advised by the Lords of Trade to unite for general defense, a formal plan for a permanent general government of all the English colonies was drawn up by Benjamin Franklin (q.v.) and presented at the Albany Convention (q.v.); but it was rejected by both the colonies and the Crown.

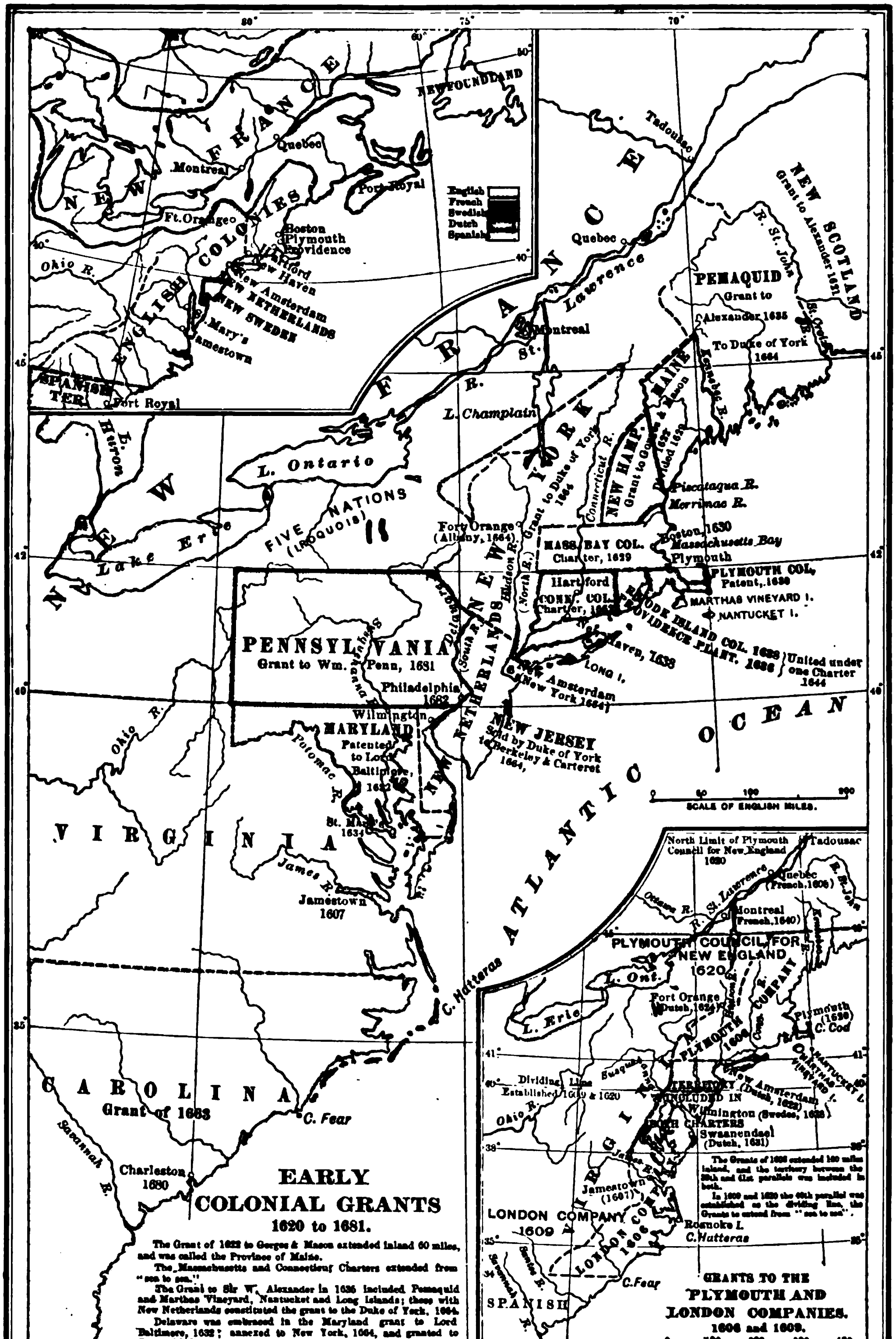
Although the several colonies were at no time organically connected, except through the King, the basis for union was early laid in the establishment of local governments in which the controlling principles were similar. There appeared also a substantial identity in forms and in practices of local government. This made it natural that occasionally during the colonial period there should appear marked tendencies toward union. In some respects, however, different types of population distinguished the several portions of settled territory, a fact due in some measure to the various classes of people in England from which the immigrants came. Thus during the period between 1620 and 1640 large numbers of dissenters withdrew from England, and the settlements in the north increased in number and population, the main colony of Massachusetts Bay being established in 1628-30, and numerous towns in the neighboring district being soon founded, while settlements were made (1635-36) at Hartford, Wethersfield, and Windsor, the three towns which originally constituted the colony of Connecticut, and for the administration of which was adopted in 1639 the first written constitution of representative government. In 1638 the colony of New Haven was established. In this period also the same body of population extended northward into what became New Hampshire, as well as into the northeastern portion of Massachusetts. On the other hand, a representative of the aristocratic class founded the colony of Maryland in 1634. During the period of the Commonwealth in England most of the immigrants were drawn from the Cavalier and Royalist classes, which were then out of power, and by this phase of migration Virginia and Maryland especially profited. Following the Restoration the increased power of the King in colonial politics was illustrated in the grant of the Carolinas to a body of proprietors, and of Pennsylvania to a single proprietor, while in the same period New York, acquired in 1664 by conquest from the Dutch, was organized as a royal province. The administration of New Jersey was given over to a body of proprietors, and the various settlements in Rhode Island were organized by charter into a colony. Throughout this period there was a steady development of uniformity in the provincial governments. At the basis of it all lay the principles of a democratic or representative government, which were brought to America by the earliest colonists. A representative and popular government was established in Virginia as early as 1619, before the founding of the New England colonies, in which democratic institutions existed from the outset. Coincident with this growth of uniformity, and this preparation for unity in organization as well as in action, appeared indications of divergence in theory as to the proper position of the provinces within the English State. On the one hand, in the instances where even the executive was chosen within the province and where no provision was made for the approval of provincial laws by the King, there appeared substantially independent local autonomy, the prevalence of which type would create a thoroughly decentralized system of government. On the other hand, in the instances where the Governor and all important executive and judicial officers were appointees of the Crown, where the governor's council was chosen by the Crown, and where all provincial laws were subject to the approval of the Crown, there was created a strongly centralized form of imperial government. Both of these types of provincial administration appeared in the colonial period, although they were irreconcilable, and as one form of government recognized privileges which the colonists would not relinquish and which the home Government would not recognize as rights, and as the other form included powers which the colonists claimed were improperly exercised by the King, it was inevitable that the attempt forcibly to harmonize the two systems should create such friction as to foreshadow revolution. Originally, the colonies were regarded as within the King's exclusive jurisdiction, and it was not until the Protectorate and the reign of Charles II. that they were considered as organic portions of the Empire, so as to be governed by Parliament; then Navigation Laws (q.v.) were passed to give British ships a monopoly of commerce, certain articles produced in the colonies were required to be sent to England, and duties were levied on commodities sent from one colony to another. Protests were made against these assumptions; Massachusetts and other provinces asserted their rights of self-government and of exemption from Parliamentary control; and it was not until the English revolution of 1688 that settled and uniform relations with the several colonies were established, and the increased authority of Parliament, both within the realm and in the colonies, was fully recognized.

The effect of that revolution made more critical the underlying problem of the colonial situation, and gradually made conspicuous the issue whether in the colonies the legislative authority of Parliament was paramount. On the other hand, the revolution had a beneficent effect upon the colonies in terminating unrest and friction, which had characterized the administration of the later Stuarts. Even in Virginia the prevalent discontent had been given violent expression in Bacon's Rebellion (q.v.) in 1676, while in the Northern colonies the many contests over jurisdiction and rights and the arbitrary rule established by Andros (q.v.), who had been appointed Governor of all the colonies north of latitude 41° N., developed a general disaffection among the people to the home Government and culminated in the seizure of Andros and the overthrow of his administration (1689).

In 1713, by the Treaty of Utrecht, England, which had been importing slaves from Africa into its American and West Indian colonies, obtained a monopoly of the slave trade to Spanish America for thirty-three years, and as a result of this arrangement slavery was extended in, and to some extent forced upon, all the American colonies. See SLAVERY.

During much of the seventeenth and eighteenth centuries there was a general feeling of loyalty toward the mother country. The sons of the more wealthy colonists, especially in the South, were educated in England. English literature was widely read in the colonies; the colonies, though distinct, and differing in origin and character—Puritan in the East, largely Dutch Reformed in New York, Quaker in Pennsylvania, to a considerable extent Catholic in Maryland, and Anglican in Virginia—were yet united by language, blood, and institutions.

These influences toward harmony with the mother country served to obscure, to a considerable degree, the recurrent disputes over charter rights and trade privileges, which continued to prevail in the eighteenth century; and the tendency to union among the several colonies was strengthened by the outbreak of the French and Indian War (q.v.). This was the last in the series of conflicts (see KING WILLIAM'S WAR; QUEEN ANNE'S WAR; and KING GEORGE'S WAR; also see CANADA) which resulted from the respective territorial ambitions in North America of France and Great Britain, and left the latter in undisputed possession of Canada as well as of the territory lying between the Alleghanies and the Mississippi. As a result of the termination of this long continued struggle with the French, which was followed by the Pontiac conspiracy of 1763 (see PONTIAC), the colonies, which had naturally borne the brunt of the various conflicts in America, were relieved of much of their dependence upon the home Government, and were left freer than they had earlier been to look after what they conceived to be their rights and interests. On the other hand, the financial necessities resulting from that war led to measures by the home Government which aroused the colonists, strengthened their feelings of unity among themselves, and lessened their attachment to the English administration. Under such circumstances, the basis of intercolonial



EARLY COLONIAL GRANTS

1620 to 1681.

The Grant of 1622 to Gorges & Mason extended inland 60 miles, and was called the Province of Maine.

The Massachusetts and Connecticut Charters extended from "sea to sea."

The Grant to Sir W. Alexander in 1636 included Pemaquid and Marthas Vineyard, Nantucket and Long Islands; these with New Netherlands constituted the grant to the Duke of York, 1664.

Delaware was embraced in the Maryland grant to Lord Baltimore, 1632; annexed to New York, 1664, and granted to Penn, 1682, and known as the Lower Counties. In 1703 it received a separate legislature.

GRANTS TO THE PLYMOUTH AND LONDON COMPANIES.

1606 and 1609.

The Grants of 1606 extended 100 miles inland, and the territory between the 38th and 41st parallels was included in both.

In 1609 and 1620 the 40th parallel was established as the dividing line, the Grants to extend from "sea to sea".

COPYRIGHT, 1903, BY DODD, MEAD & COMPANY.

unity gave force to the expressions and acts of the home Government, as when in 1761 the enforcement of the Navigation Acts by general search-warrants (see ASSISTANCE, WRITS OF) caused strong resentment against the home Government, especially in New England, where the Admiralty attempted to enforce the law, many vessels being seized, and the colonial trade with the West Indies being seriously affected. In 1765 the passing of an act of Parliament (see STAMP ACT) for collecting a colonial revenue by requiring the use of stamps not only upon many business papers and legal documents, but also upon certain articles of ordinary use, caused general indignation, and led even to riots. Steps were promptly taken to unite against the common danger of an extension of the authority of Parliament; the famous Stamp Act Congress, in which nine colonies were represented, met at New York in September, 1765, and issued a statement of grievances and a declaration of rights. The stamps were destroyed or reshipped to England, and popular societies, called 'Sons of Liberty' (q.v.), were formed in the chief towns. In 1766 the Stamp Act was repealed, to the general relief of the colonists; but the principle of colonial taxation by Parliament was reaffirmed, and in 1767 duties were levied on glass, paper, printers' colors, and tea. This renewed attempt produced, in 1768, disturbances in Boston, where Governor Gage was furnished with a military force to preserve order and enforce the laws, and where thenceforth the relations between the provincial legislature and the royal Governor were especially strained, much bitter feeling among the people being caused by the so-called Boston massacre (q.v.) of March 5, 1770. In 1773 the duties were repealed, excepting 3d. a pound on tea, when the matter resolved itself into a question of principle, and from North to South the people became determined that this tax should not be paid. In Boston a crowd, disguised as Indians, threw a cargo into the harbor (December 16, 1773). As a penalty for such acts, Parliament passed, in 1774, a series of punitive statutes, including the so-called Charter Act, by which the popular element in the provincial government of Massachusetts was greatly reduced and by which the former independence and authority of town-meetings was strictly limited, and including also the Boston Port Bill (q.v.), by which the chief town of New England was to be no longer a port of entry. Boston was reduced to great distress, but received the active sympathy and encouragement of all the colonies.

The people of Massachusetts, relying upon the theory that their charter partook of the nature of a compact which could be altered or abrogated only by the consent of themselves and of the King, denied the right of Parliament to pass statutes in any way modifying their charter rights, and insisted that the course of the King and Parliament released the colonists from all obligations and reduced them, so far as government was concerned, to a 'state of nature.' Thus, as early as the fall of 1774 the colonists began to organize local government on the assumption that administrative relations with England had been terminated, and that the authority of the home Government had ceased. Under such circumstances it was inevitable that the Administration should undertake to apply a policy of repression. For further details of colonial history, see, besides the articles already referred to, the articles on the various States.

WAR OF INDEPENDENCE. It was now determined to enforce the authority of Parliament over the colonies, and a fleet, containing several ships of the line and 10,000 troops, was sent to America. The colonies, still asserting their loyalty, and with little or no thought of separation from the mother country, prepared to resist what they considered the unconstitutional assumptions of the home Government and the unwarranted violations of their rights as English citizens. Volunteers were drilling and depots of provisions and military stores were being formed. The sending of a small force from Boston to seize one of these depots at Concord, Mass., and to capture two of the most prominent provincial leaders, Samuel Adams and John Hancock, who were staying temporarily at Lexington, led to engagements at Lexington and at Concord (see LEXINGTON), and the real beginning of the Revolutionary War, on April 19, 1775. The British troops were compelled to retreat, and the news of this event promptly brought from fifteen to twenty thousand armed provincials to the vicinity of Boston, to which place the British, then numbering less than 4000, were effectually confined. On May 25, 1775, reinforcements under Howe, Clinton, and Burgoyne increased the strength of the British army to 10,000 men. Outlying royal forts and arsenals, with their arms and munitions, were taken possession of by the colonists, and on May 10th and May 11th respectively Ticonderoga and Crown Point, the principal Northern fortifications, were surprised by organized forces, and their artillery and stores appropriated. A congress of the colonies, known as the Continental Congress, had assembled at Philadelphia in September, 1774, and after appeals to the home Government, which proved unavailing, this body resolved to raise and equip an army of 20,000 men, and on June 15, 1775, appointed George Washington commander-in-chief. On June 17th, Breed's Hill, in Charlestown, near Boston, where a considerable force of Americans had hastily intrenched themselves, was taken by assault by the British troops, but with so heavy a loss that the defeat had for the provincials the moral effect of a victory. (See BUNKER HILL, BATTLE OF.) After a winter of great privation, during which they were closely besieged within the only city in their control, the British were compelled on March 17, 1776, to evacuate Boston, carrying away in their fleet to Halifax a large number of Loyalists. To forestall an expected attack by Sir Guy Carleton, Governor of Canada, upon Ticonderoga, an American force under Montgomery was sent in August, 1775, to invade Canada by way of Lake Champlain, while in September another American force under Benedict Arnold was sent from Cambridge through the forests of Maine against Quebec. Montgomery captured Chambly, Saint Johns, and Montreal, but on December 31, 1775, the Americans were defeated before Quebec, Montgomery being killed and Arnold wounded, and in the summer of 1776 the Americans were forced to abandon Canada.

After the evacuation of Boston the British

Government put forth a stronger effort to reduce the colonies to submission. An army consisting of 55,000 men, of whom 17,000 were Hessian mercenaries, was sent, under the command of Sir William Howe, to put down this 'wicked rebellion.' The Congress, declaring on May 15, 1776, that the royal authority had ceased, recommended to the several colonies to adopt "such governments as might best conduce to the safety and happiness of the people;" and most of the thirteen colonies soon adopted constitutions as independent and sovereign States. On June 7, 1776, Richard Henry Lee (q.v.), of Virginia, offered a resolution in Congress, declaring that "these United Colonies are, and of right ought to be, free and independent States; that they are absolved from all allegiance to the British Crown; and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved." This resolution was adopted on July 2d by the votes of twelve out of thirteen colonies, the New York delegates, who had not as yet received instructions, being excused from voting. A committee, consisting of Thomas Jefferson, John Adams, Benjamin Franklin, Roger Sherman, and Robert R. Livingston, had been appointed, on June 10th, to prepare a declaration in accordance with the above resolution; and the Declaration of Independence (q.v.), written by Jefferson, based upon the equality of men, and asserting that "all government derives its just powers from the consent of the governed," on July 4, 1776, received the final assent of the delegates of twelve colonies (the New York delegates still not voting), who thus undertook to dissolve the allegiance of the colonies to the British Crown, and to declare them free and independent States.

After the evacuation of Boston General Washington, with the greater portion of his army, had hastened to New York, which was the centre of hostilities during the following summer. General Howe, having been joined by his brother, Admiral Lord Howe, and Sir Henry Clinton, defeated the Americans in the battle of Long Island, August 27, 1776 (see LONG ISLAND, BATTLE OF), and thus was enabled to compel the evacuation of New York and secure the possession of its harbor and of the lower Hudson River. In spite of the gallantry of the Americans at the Battle of Harlem Heights, the British retained secure control of the city, and then sent a force from Long Island Sound into Westchester County, where was fought the battle of White Plains (October 28, 1776), after which Washington, with the larger part of his army, crossed over into New Jersey, leaving, however, a considerable force in the upper portion of Manhattan Island. There, on November 16th, Fort Washington (q.v.) was captured, along with its entire garrison of about 2600 men. Washington then retreated across New Jersey toward Philadelphia, closely followed by the British, under Cornwallis, into whose hands Newark, New Brunswick, and Princeton successively fell. The British then awaited the freezing of the Delaware in order to be able to occupy Philadelphia. On Christmas night General Washington crossed in boats amid floating ice, and early on the following morning surprised and captured a Hessian force at Trenton (q.v.). On January 3, 1777, he fought the successful battle of Princeton (q.v.), by which the waning confidence of the colonists was to a large extent restored, and the prospects of the American arms materially improved. The British thereupon retired to New York, where they spent the rest of the winter.

In the meantime Silas Deane and Benjamin Franklin had been sent to France to solicit recognition and aid, and although formal recognition was delayed, important assistance was privately given in money and supplies, and European volunteers—the Marquis de Lafayette, Baron Steuben, Baron de Kalb, Kosciuszko, and Pulaski—rendered most important services. Efforts were also made, but without success, to induce the British colonies of Canada and Nova Scotia to unite in the struggle for independence, and diplomatic agents in Europe attempted to secure recognition and material assistance from various Powers. Late in September, 1777, after the defeat of the Americans on the 11th at Chadd's Ford on the Brandywine (see BRANDYWINE, BATTLE OF), the British, who under Howe had come by water from New York to the head of Chesapeake Bay, took possession of Philadelphia; and Washington, after attacking the British unsuccessfully on October 4th, at Germantown (q.v.), went into winter quarters early in December at Valley Forge (q.v.), where his troops suffered greatly from cold and hunger.

In the meanwhile General Burgoyne was leading an army of 7000 British and Hessian troops with probably a larger force of Canadians and Indians, from Canada into northern New York, in order to form a junction with the British on the lower Hudson, and thus, by gaining virtual control of New York, separate New England from the rest of the Confederacy. In cooperation with him another force, mostly of Loyalists and Indians, under Saint Leger, was to proceed from Canada by way of Oswego and the Mohawk Valley to the Hudson, but this force was unable to capture Fort Stanwix on its line of march, and after the battle of Oriskany withdrew. (See SAINT LEGER; FORT STANWIX; and ORISKANY, BATTLE OF.) Burgoyne's march was delayed by felled trees and destroyed roads; the defeat of a large force of foragers at Bennington (August 16, 1777) was a severe reverse (see BENNINGTON, BATTLE OF); and after the two sharp battles of Saratoga (q.v.)—on September 19th and October 7th—he was compelled to capitulate to General Gates, October 17, 1777, and England heard with dismay of the loss of an entire army. The Americans took between 5000 and 6000 prisoners and much artillery.

This victory has been regarded as the turning-point of the war. Almost equally important with its military results was its effect upon international relations, in that it gave to the European Powers the first definite proof of the possibility and even the probability of colonial success, and made it feasible for France, with a greater degree of propriety, to recognize formally the new nation, and to enter into a treaty of alliance with the United States on February 6, 1778, a step which largely altered both the military and political situation, and hastened the final success of the Americans. The recognition of the new nation by France prompted Lord North to a policy of reconciliation, but his commissioners, though empowered to grant virtually everything for which the colonists had originally taken up arms, were unable to secure a favorable reception without a prior recognition of the independence of the United States.

In the summer of 1778 the Americans were strengthened by the presence of a French fleet and of a considerable land force, and after the abandonment of Philadelphia by Sir Henry Clinton, who had replaced Howe in May, 1778, their opponents in the north were confined to Newport and to the region around New York City. As Clinton withdrew from Philadelphia and marched across New Jersey toward New York, he was followed by Washington, who gained a qualified success at Monmouth on June 28, 1778. (See Monmouth, Battle of.) Thereafter the greater energy on both sides was devoted to the campaign in the South, though in 1778-79 George Rogers Clark (q.v.) achieved a virtual conquest of the Northwest. Savannah was taken (December 29, 1778) by the British, who in the following two years, under Clinton and Cornwallis, secured control of Georgia and South Carolina, taking Charleston May 12, 1780. In June, 1780, General Gates was placed in command of the Southern Department, and on August 16th was badly defeated by Cornwallis at Camden (q.v.). Soon afterwards, on September 23, 1780, General Benedict Arnold's treasonable plot to surrender West Point was frustrated through the capture of Major André. The first real reverse of the British forces in the South was that experienced at the hands of the hurriedly gathered backwoodsmen at King's Mountain (q.v.), October 7, 1780. In the following December General Gates was superseded by General Greene as commander of the American army in the South, and a more active campaign was thereafter undertaken. At the Cowpens, January 17, 1781, the force of Tarleton, the British cavalry leader, was overwhelmed by the Americans under Morgan, while Cornwallis, after a dearly bought victory over Greene at Guilford Court House, March 15, 1781, was compelled to retire to Wilmington. Two more important battles, at Hobkirk's Hill (April 25, 1781) and Eutaw Springs (September 8, 1781), marked the contest for the control of the Southern territory. Finally the army of Cornwallis was confined between the York and James rivers, where, with the French controlling the sea, the British commander was unable to hold out long against the Americans and French under Washington and Rochambeau. His surrender at Yorktown (q.v.) on October 19, 1781, assured the triumph of the American cause. The provisional treaty of peace was signed at Paris in November, 1782, a cessation of hostilities was declared by Washington in January, 1783, and on September 3, 1783, the definitive Treaty of Paris was signed. (See Paris, Treaties of.) This treaty, besides recognizing the independence of the United States, secured to the country the territory between the Alleghanies and the Mississippi. On November 25, 1783, New York was evacuated by the British.

The Confederation. The need of more unity of action having been felt, Articles of Confederation, first reported to Congress in July, 1776, had been adopted by that body in November, 1777, and by May, 1779, all the States had formally ratified them except Maryland, which refused its assent so long as the various States continued to hold their Western lands. Finally New York offered to cede to the General Government her claims to such lands, and, it being evident that other States would follow her example, Maryland gave her assent to the Articles in 1781, and the necessary unanimous adoption having thus been secured, the Articles of Confederation went into effect. The result was the formation of a 'league of friendship' only, the General Government having no power of coercion, and the various States being virtually independent. The Articles provided, among other things, that each State was to have only one vote in Congress, that Congress was to be vested with the power of declaring war and peace and of negotiating treaties, that both the General Government and the States were to have the power of coining and issuing money, that the various States were to be intrusted with the regulation of commerce and the raising of revenue, that Congress on appeal was to decide all controversies between States, and that when Congress was not in session a 'Committee of the States,' appointed by that body, was to manage the general affairs of the Confederation.

When the long war had ended, the States had become free, but the inefficacy of their form of federal government became more and more apparent, and the condition of the young Confederacy seemed most discouraging. Its treasury was empty; it was burdened with a foreign debt of $8,000,000, domestic obligations of $30,000,000, and a paper currency of nearly $90,000,000 which no one would receive. Moreover, the Congress whose predecessor had incurred these various obligations had now no power to provide for discharging them. It could only make recommendations to the States and urge them to provide their share toward the expenses of the Government, and was wholly without power to enforce either upon individuals or upon the States a compliance with its requirements, while, furthermore, the States were themselves in debt, and unable as well as unwilling to respond to the demands of the Congress. An amendment to the Articles of Confederation empowering Congress to levy a five per cent. duty on imported goods was proposed in 1782, but was defeated by Rhode Island, which alone of the States withheld its assent. The resistance offered to constituted authority in Massachusetts in 1786-87, when a portion of the people actually organized to resist the collection of debts and to close the local courts (see Shays's Rebellion), emphasized the need of a stronger central government.

After the close of the Revolutionary struggle, weakness of the General Government was even more keenly realized than before. Congress had no power of maintaining an army or navy, no control over commerce, no means of actually raising public funds, and no effectual mode of enforcing its will even in matters over which it nominally had jurisdiction. In the words of Washington, it was "little more than the shadow without the substance." Moreover, from its want of power, it soon became despised and neglected by those who should have been its chief supporters, and the ablest men preferred to devote themselves to the politics of their own States. Congress consisted of scarcely more than twenty members, few of whom in its closing years were men of any great influence. The evils of this lack of system were soon made evident, when, after some difficulty, twelve States had assented to a general system of import duties, and the thirteenth, New York, resisted, and thus alone was able to defeat a measure which was essential to the credit and security of the whole nation. So, too, articles in the treaty with England were set at naught by the different State governments, laws being passed by the various Legislatures in direct defiance of these articles, while Congress was unable to do more than merely to exhort them to annul these laws and to comply with the treaty. In this state of affairs, thoughtful men began to see that, if the United States were to exist as a nation, there must be a central government with direct power both in internal and external affairs, able to carry on foreign negotiations in the name of the nation, to create statutes operative upon all the citizens of the States, to enforce these statutes, and, if necessary, to punish those who neglected them. The first men clearly to perceive and boldly to declare this were Alexander Hamilton and James Bowdoin.

The Constitution. Though Hamilton had been among the most ardent supporters of American independence, he was not an advocate of the system of government that had been the immediate result of the war. He wished his countrymen to secure the advantages of a strong central government, and the model that he had in mind was the English system, without the monarchical principle. In 1785 an opportunity occurred of effecting, or at least of suggesting, a radical change. In that year commissioners were appointed by Virginia and Maryland to settle certain difficulties about the navigation of the Potomac River and Chesapeake Bay. They met at Mount Vernon, Washington's home, where a plan was proposed for settling commercial duties, and this led to the proposal, made by the Assembly of Virginia, for a general conference of commissioners from all the States to consider the state of trade. Hamilton, seeing that this conference might be made the instrument of more fundamental changes, persuaded New York to send commissioners, himself among them; and in 1786 commissioners from five States met at Annapolis, Md. (See Annapolis Convention.) Hamilton laid before them a report, giving reasons for calling a convention of delegates from all the States to consider the reorganization of the National Government. Such a proposal was adopted by the conference and submitted to Congress, by which it was indorsed, with the recommendation that each State should send delegates to a National Constitutional Convention. The suggestion was generally adopted, and the convention met at Philadelphia in May, 1787. Washington was chosen president of the body, which proceeded to create an entirely new scheme of government rather than to revise the existing plan as had been originally intended.

The two paramount questions at issue were the powers of the Federal Government and of the individual States and the system by which the States were to be represented in the Federal Legislature. Two tentative plans were laid before the convention, one by Edmund Randolph of Virginia, the other by William Paterson of New Jersey. The 'Virginia Plan,' as the former was commonly called, provided that in each branch of the National Legislature representation should be according to population, while the 'New Jersey Plan' provided for equal representation of the States in each branch. The practical question at issue was settled by the so-called 'Connecticut Compromise,' according to which in one branch of the National Legislature representation of the States should be according to population, while in the other branch it should be equal. Other compromises were also necessary in the convention, as a result of which Congress was to be given control over commerce, three-fifths of the slaves were to be counted in estimating the population of a State with reference to its representation in the Lower House, and the various States were given power to admit imported slaves for twenty years. The frame of government drawn up, with subsequent amendments, has continued to be the Constitution of the United States to the present day. See Constitution.

The difficulties incident to the ratification of the proposed Constitution were enormous. The old Congress was still in existence as the National Government, but it was in even lower repute, and of less influence, than it had been earlier in the decade, and it confessedly had neither the authority nor the power to take effective steps for the establishment of the new form of government. The convention accordingly determined to report its proceedings to the old Congress, which body was to submit the Constitution to each State for acceptance or rejection, the people of each State expressing themselves through a convention called for the purpose. All questions at issue were now revived in the vigorous and protracted discussions and contests which took place in several of these conventions. Two bitterly opposing parties arose, the Federalists (q.v.) and the Anti-Federalists, the former favoring the Constitution and the latter rejecting it. Some of the States ratified the Constitution promptly; but in others, especially Massachusetts, Virginia, and New York, the opposition was strongly developed and it was only after a protracted struggle that the opposition of such men as Patrick Henry in Virginia, and of Melancthon Smith and Yates in New York, was overcome. To this end the chief single contribution was made by the influence of *The Federalist* (q.v.), the series of essays produced by Hamilton, Madison, and Jay, in explanation and justification of the convention's work. Finally, on June 21, 1788, the ninth State, New Hampshire, ratified the Constitution, and, according to the terms of the instrument itself, by that event it went into force. The two important States of Virginia and New York followed with their approval on June 25th and July 26th, respectively, leaving only North Carolina and Rhode Island in the anomalous position of not being members of the new nation which claimed jurisdiction over their territory.

During the whole period of the Confederation Congress had enacted only one piece of legislation of extraordinary and enduring importance—the Ordinance of 1787 for the government of the Northwest Territory. (See Northwest Territory.) After the ratification of the Constitution by the requisite number of States, the old

Congress arranged a plan for carrying the new government into operation. The first Wednesday of January, 1789, was selected for the choice of electors for President and Vice-President, the first Wednesday in February for the voting of the electors, and the first Wednesday in March as the date of the inauguration. The 69 electors who met in February all voted for George Washington, who was accordingly chosen President. The next highest number of electoral votes cast was 34, which were given to John Adams, who was thus elected Vice-President in accordance with the method then prescribed by the Constitution. Owing to delays, however, the actual inauguration of the new Government did not take place until April 30, 1789.

I. and II. ADMINISTRATION OF GEORGE WASHINGTON (1789-1797). *Cabinets.—Secretary of State*, Thomas Jefferson, Virginia, September 26, 1789; Edmund Randolph, Virginia, January 2, 1794; Timothy Pickering, Pennsylvania, December 10, 1795. *Secretary of the Treasury*, Alexander Hamilton, New York, September 11, 1789; Oliver Wolcott, Connecticut, February 2, 1795. *Secretary of War*, Henry Knox, Massachusetts, September 12, 1789; Timothy Pickering, Pennsylvania, January 2, 1795; James McHenry, Maryland, January 27, 1796. *Attorney-General*, Edmund Randolph, Virginia, September 26, 1789; William Bradford, Pennsylvania, January 27, 1794; Charles Lee, Virginia, December 10, 1795. *Postmaster-General*,* Samuel Osgood, Massachusetts, September 26, 1789; Timothy Pickering, Pennsylvania, August 12, 1791; Joseph Habersham, Georgia, February 25, 1795.

George Washington was sworn into office on April 30, 1789, at New York, where the newly elected Congress, the first under the Constitution, had assembled earlier in the month. The House of Representatives elected Frederick A. Muhlenberg, of Pennsylvania, as the first Speaker. The first Congress witnessed a gradual formation of two political groups, opposing each other on questions of centralization and decentralization, those favoring a liberal interpretation of the powers of the Federal Government being known as Federalists, and those favoring a very strict interpretation and limitation of these powers soon styling themselves Democratic-Republicans or simply Republicans. The latter was made up in great part of the Anti-Federalists of 1787-88, but also came to include some of the advocates of the Constitution, Madison among them. Both factions were represented in Washington's first Cabinet, Hamilton coming to be the recognized leader of the Federalists, and Jefferson coming to be regarded as the ablest advocate of the strict-constructionist doctrine.

Three important events of Washington's first administration, all closely connected with the work of Hamilton, were the inauguration of a scheme of tariff (see TARIFF), directed primarily toward the raising of revenue, but also based upon the expediency of encouraging domestic industries, the establishment in 1791 of a national bank (see BANK, BANKING), planned to serve partly as a fiscal agency of the new Government, and the systematizing and funding of the national debt, in which were now included not only the strictly national debts, but also those obligations of the several States which had been incurred for national purposes during the Revolution. The political controversy over this assumption of State debts by the National Government was, for purposes of convenient adjustment, combined with the pending controversy as to the location of the national capital, the opponents of 'assumption' yielding upon that proposition in sufficient number to secure in return the choice of the banks of the Potomac as the seat of government. The Constitution had been put into operation without any settlement of the delicate and vital question of the authority of the new Government over the territory of the States which at that time had not ratified that instrument, and the possibility of a crisis was early removed by the successive ratifications by North Carolina (November, 1789), and by Rhode Island (May, 1790). Membership in the Union was further increased by the admission of Vermont (March, 1791), and of Kentucky (June, 1792). In Washington's first term executive departments were organized by acts of Congress, the Federal judicial system was organized, in September, 1789, a national mint was established in Philadelphia, and a system of coinage devised, and in 1791 the first ten amendments to the Federal Constitution were formally adopted.

At the request of both Federalists and Republicans, Washington consented to serve a second term as President, and was unanimously reëlected. John Adams was also reëlected to the office of Vice-President, being opposed by George Clinton (q.v.), of New York, the Republican candidate. Washington's second term was one of much public turmoil and uneasiness, owing to the attitude of the two parties toward France and England, then at war. The Federalists expressed an open sympathy with England; the Republicans with France. The conduct of the French Minister to the United States, known as 'Citizen' Genet (q.v.), did much to increase the popular excitement. He openly violated the President's proclamation of neutrality, endeavored to fit out French cruisers in American ports, raised money and men for the service in France, and acted with such offensive and undisguised insolence toward Washington and his Cabinet that the Government demanded his recall. The turbulence resulting from his injudicious course, however, had inflamed party passions to such an extent that even Washington's calm and dignified policy did not escape the bitterest partisan denunciation. This increased in volume and intensity when the so-called Jay Treaty (q.v.) with England was laid before the Senate by the President. England's course had been regarded as arrogant and far from conciliatory. She had impressed American seamen, had refused, ostensibly because of the neglect of the United States to carry out certain provisions of the treaty of peace, to evacuate the posts in the Northwest Territory, and had largely excluded American commerce from the West India trade. The Jay Treaty failed to secure the assurances from England that many believed to be justly due; but it embodied the best that could then be obtained, and the President approved it. The aspersions now recklessly heaped upon Washington became virulent; he was threatened with impeachment, and even was accused of treason and of usurpation. Yet his action was justified by the revival of commerce that followed the ratification of the Jay Treaty.

---

* The Postmaster-General was not regularly a member of the Cabinet until 1829.

The other noteworthy events of Washington's second administration were the fortunate and effective assertion of the authority of the Federal Government in the suppression of the so-called Whisky Insurrection (q.v.) in Pennsylvania (1794), the adoption of a plan for internal taxation (1795), the unsuccessful expeditions under Harmar and Saint Clair against the Western Indians in 1790 and 1791, the defeat of the Indians by Wayne at Fallen Timbers in 1794, the cession to the United States in the following year of 25,000 square miles of Indian lands, and the negotiation of a treaty with Spain in 1795, whereby the United States secured the free navigation of the Lower Mississippi, the right of deposit, for a limited period, at New Orleans, and a partially satisfactory settlement of the Florida boundary. The year 1793 was marked by the invention, by Eli Whitney, of the cotton gin, which was destined to bring about an industrial revolution in the South and profoundly to affect the question of slavery. In June, 1796, Tennessee, hitherto a part of North Carolina, was admitted to the Union as a new Commonwealth. On September 17th of the same year Washington delivered his historic "Farewell Address." As he declined again to be a candidate, the two great parties waged an open warfare for the election of his successor. The Federalist candidate, John Adams, received 71 votes, and the Republican, Thomas Jefferson, 68 votes, and in accordance with the constitutional provisions then operative, John Adams became President, and Thomas Jefferson Vice-President.

III. ADMINISTRATION OF JOHN ADAMS (1797-1801). *Cabinet.—Secretary of State,* Timothy Pickering, continued; John Marshall, Virginia, May 13, 1800. *Secretary of the Treasury,* Oliver Wolcott, continued; Samuel Dexter, Massachusetts, January 1, 1801. *Secretary of War,* James McHenry, continued; Samuel Dexter, May 13, 1800; Roger Griswold, Connecticut, February 3, 1801. *Secretary of the Navy,* George Cabot, Massachusetts, May 3, 1798;* Benjamin Stoddert, Maryland, May 21, 1798. *Attorney-General,* Charles Lee, continued; Theophilus Parsons, Massachusetts, February 20, 1801. *Postmaster-General,* Joseph Habersham, continued.

At first the prospects of the new Administration and of the Federalist Party seemed extremely bright. The insolent action of the French Directory, then at the head of affairs in France, in demanding of the American commissioners a bribe in return for a favorable hearing, inspired everywhere in the United States the most intense indignation. (See X Y Z CORRESPONDENCE.) War seemed imminent; indeed, hostilities actually began (1799) on sea, and General Washington was again summoned to command the army, with Hamilton as the actual head until the outbreak of hostilities. But a change in the French Government made possible a reconciliation, and in 1800 a treaty removed the immediate cause of complaint.

Such popularity as the Government had secured by its firm attitude toward France was soon lost by the passage, in 1798, of the unwise 'Alien and Sedition Acts' (q.v.). These acts were generally felt to be opposed to those principles of the Constitution which assured the rights of individuals and of the States, and they brought the Government into great disrepute. Congress, however, was still largely controlled by the Federalists, and hence the Republicans were obliged to protest against the new enactments through the medium of the State Legislatures. Resolutions of protest drawn by Jefferson and Madison were passed by the Legislatures of Virginia and Kentucky, and became known as the 'Virginia and Kentucky Resolutions' (q.v.). These resolutions expressed the extreme Anti-Federalist doctrine, and precipitated an immediate agitation against the obnoxious laws, which helped to cause the defeat of the Federalist Party in the Presidential election of 1800. During Adams's administration the seat of the government was changed, in 1800, from Philadelphia, which had been the temporary capital for ten years, to Washington, in the newly constituted District of Columbia, and John Marshall, who was destined to influence profoundly the constitutional law of the nation, became Chief Justice of the Supreme Court. In the election of 1800, 73 electoral votes were cast for Thomas Jefferson and the same number for Aaron Burr, also a Republican, while Adams had 65. There being thus no choice, the election was thrown in accordance with Article II. of the Constitution into the House of Representatives, each State having only a single vote. After balloting for six days the House of Representatives elected Jefferson, who received the votes of ten States, while four States voted for Burr, and two voted in blank. Thomas Jefferson was thus chosen President, and Aaron Burr Vice-President.

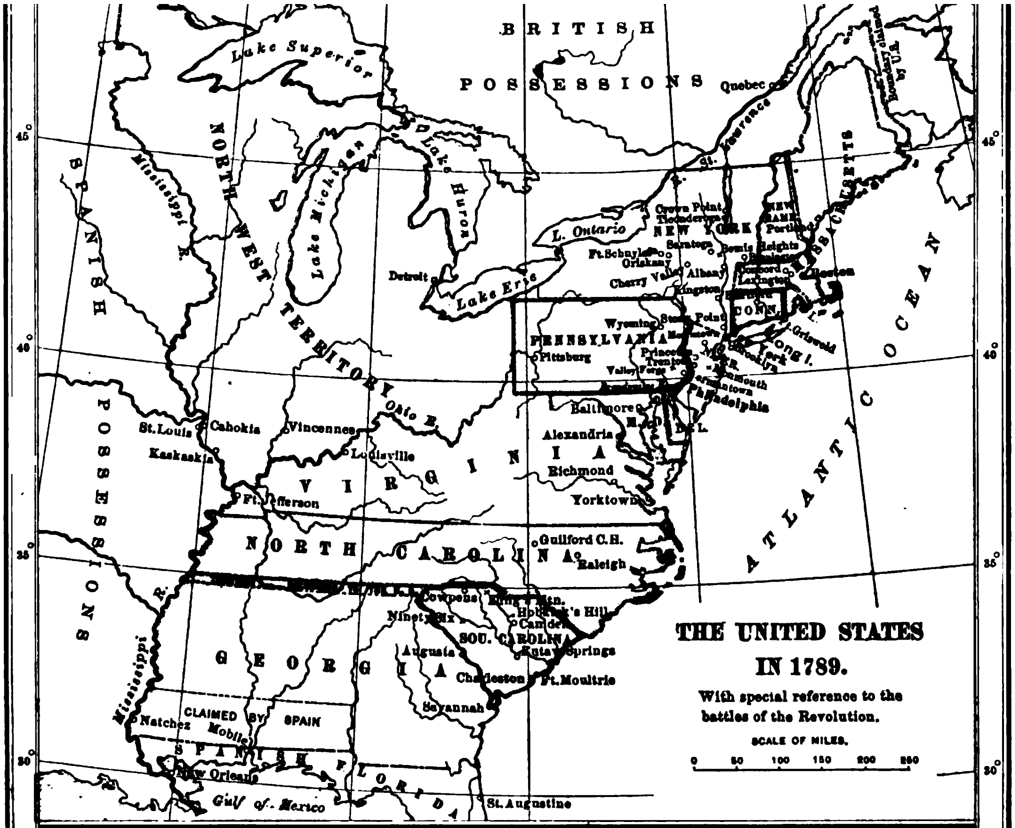
IV. and V. ADMINISTRATION OF THOMAS JEFFERSON (1801-09). *Cabinet.—Secretary of State,* James Madison, Virginia, March 5, 1801. *Secretary of the Treasury,* Samuel Dexter, continued; Albert Gallatin, Pennsylvania, May 14, 1801. *Secretary of War,* Henry Dearborn, Massachusetts, March 5, 1801. *Secretary of Navy,* Benjamin Stoddert, continued; Robert Smith, Maryland, July 15, 1801.* *Attorney-General,* Levi Lincoln, Massachusetts, March 5, 1801; Robert Smith, Maryland, March 3, 1805; John Breckinridge, Kentucky, August 7, 1805; Cæsar A. Rodney, Pennsylvania, January 20, 1807. *Postmaster-General,* Joseph Habersham, continued; Gideon Granger, Connecticut, November 28, 1801.

The election of Jefferson marked the complete triumph of the Republicans. He made a number of removals from office without cause, although chiefly of those whom Adams had appointed in the last hours of his administration and hence known as 'midnight appointments.' (See MARBURY VS. MADISON.) Jefferson professed only to desire to maintain an equal distribution of offices between the parties, and to consider only an applicant's capability and honesty. He felt free, however, to join in undoing the work of Adams by aiding in the repeal of the law creating new judicial offices to which Federalists had been ap-

---

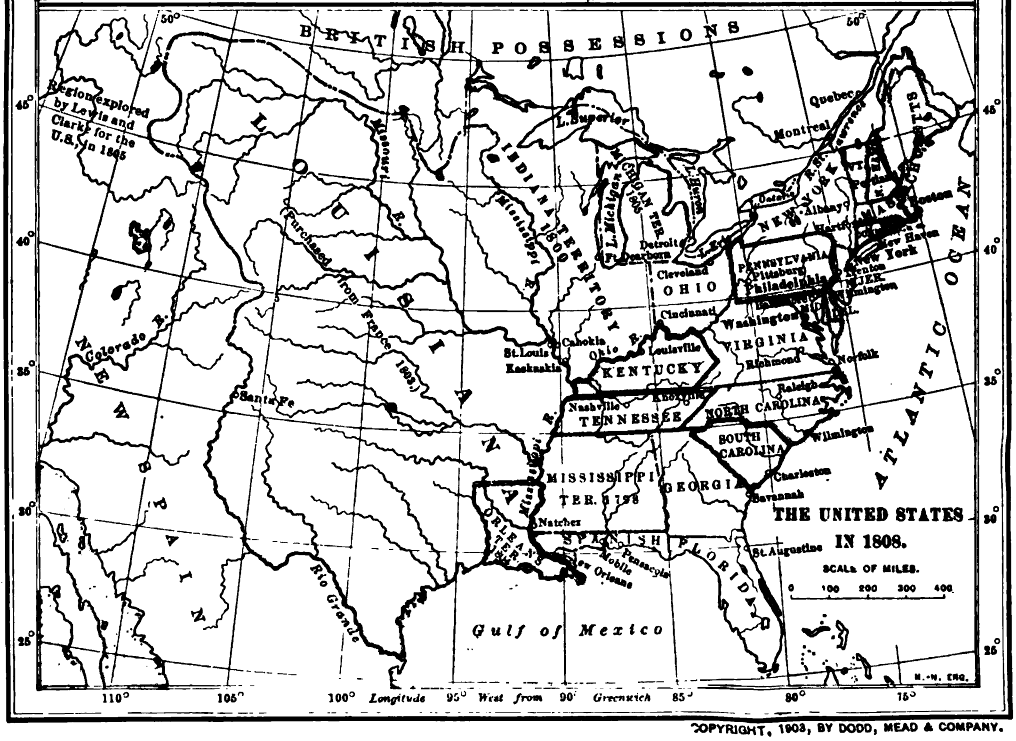
* Until this time the Navy had been under the general direction of the War Department.

* Jacob Crowninshield of Massachusetts was nominal Secretary of the Navy from March 3, 1805, till his death, April 15, 1808, Robert Smith continuing to discharge the duties of the office.



THE UNITED STATES IN 1789.

With special reference to the battles of the Revolution.



THE UNITED STATES IN 1808.

COPYRIGHT, 1903, BY DODD, MEAD & COMPANY.

pointed, and also by countenancing an attack which was made on the Federalist judges through impeachment. (See CHASE, SAMUEL.) He began his term of office with the extreme theories of the strict constructionists as his guide, as was shown by the steps which were promptly taken to bring about the abrogation of the system of internal revenue (April, 1802), and to reduce to five years the term of residence requisite for naturalization (April, 1802), as also by the repeal, in December, 1803, of the national bankruptcy law of 1800. Nevertheless, the force of circumstances finally led Jefferson to adopt and carry through measures that involved as liberal an interpretation of the Constitution as any that the Federalists had ever advanced. The first of these measures was the purchase from France in 1803 of Louisiana, which had recently been acquired by France from Spain. (See SAN ILDEFONSO, TREATY OF; LOUISIANA PURCHASE.) The annexation of this territory determined permanently the control of the Mississippi, and accordingly was thoroughly approved in the trans-Alleghany regions; but there was immediately raised not only the question of the Government's power so to acquire territory, but also the question whether the Government had acted within its constitutional powers in concluding a treaty which guaranteed citizenship to former subjects of France, and there developed a vigorous though unavailing opposition to the purchase among the members of Congress from New England. The application of a characteristic Republican policy was, however, illustrated in the marked tendency to minimize the importance of the functions of the National Government, and to render unimportant such departments as those of war and the navy. The very material reduction of the national forces was accomplished without effective opposition in view of the improved financial condition which was supposed to be secured by such a course. Any such justification was soon overbalanced by the pressing need of an efficient navy occasioned by the war with Tripoli (1801-05), in which Preble and Decatur won laurels for the American flag. (See BARBARY POWERS, WARS WITH THE.) In 1803 Ohio was admitted into the Union; and in December, 1803, Congress passed the Twelfth Amendment to the Constitution, which was ratified in 1804, providing that the electoral college should vote for Presidential and Vice-Presidential candidates separately. (See CONSTITUTION.) In 1804 Jefferson was reëlected President, receiving all the electoral votes except those of Connecticut and Delaware and two of Maryland, which were cast for the Federalist, Charles C. Pinckney, of South Carolina. George Clinton (q.v.), of New York, was elected Vice-President.

Jefferson's second administration began with overwhelming Republican majorities in both Houses of Congress. The Napoleonic wars had begun anew in 1803, and it was impossible for such a struggle not to affect materially the interests of the United States. The commerce of America was highly prosperous, her ships enjoying much of the carrying trade of Europe; but in May, 1806, England declared a blockade from Brest to the Elbe, and Bonaparte, in November, decreed the blockade of the coasts of the United Kingdom. (See CONTINENTAL SYSTEM; ORDERS IN COUNCIL.) The maritime rights of neutrals were not at that time clearly defined, and the Americans suffered at the hands of both belligerents, American vessels being seized and searched with great insolence and discourtesy for contraband of war and being searched also by the British for British subjects. The right of expatriation was not then recognized by England, and those suspected of having been born on British soil were, in accordance with the doctrine, 'once a subject always a subject,' impressed into the British naval service. The British frigate *Leopard*, meeting the American frigate *Chesapeake*, June 22, 1807, demanded four of her men, and on refusal fired into her, and the *Chesapeake* was forced to strike her flag, the incident creating intense excitement and resentment, and British ships being thenceforth forbidden to enter American harbors. See CHESAPEAKE, THE.

In December, 1807, a further step was taken in the famous Embargo Act (see EMBARGO), which forbade American vessels to leave for foreign ports, and foreign vessels to take cargoes into American ports. This measure, which was intended to punish England and France for their contempt of American rights upon the sea, almost destroyed the commerce of the United States, and was violently opposed by the Federalists, especially in New England and New York, where the shipping interest was strongest. During Jefferson's administration Aaron Burr attempted to carry out a filibustering scheme against Mexico, and in addition he was charged with an attempt at the dismemberment of the Union, and in 1807 was tried for treason at Richmond, Va., but was acquitted. (See BURR, AARON.) Jefferson's administration was also marked by the Lewis and Clark expedition (q.v.) across the continent to the Pacific (1804-06); by the passage of a bill in 1806 for the construction of a national road from Cumberland, Md., to Ohio, the first important internal improvement measure (see CUMBERLAND ROAD); the establishment of the United States Military Academy at West Point, and the successful introduction of steam navigation by Fulton. (See STEAM NAVIGATION.) Another important event of Jefferson's administration was the passage of an act of Congress in 1807 abolishing the slave trade from January 1, 1808.

Following the example of Washington, Jefferson declined to be a candidate for a third term, and in the election of 1808 James Madison, of Virginia, was elected President, and George Clinton, of New York, Vice-President. Charles C. Pinckney was again the Federalist candidate for President. In February, 1809, owing to the threatening attitude of the New England States, which seemed to menace the Government with secession, the Embargo was relaxed and the Non-Intercourse Act was substituted for it, repealing the provisions of the Embargo, except as against England and France.

VI. and VII. ADMINISTRATION OF JAMES MADISON (1809-17). *Cabinet.—Secretary of State*, Robert Smith, Maryland, March 6, 1809; James Monroe, Virginia, April 2, 1811. *Secretary of the Treasury*, Albert Gallatin, continued; George W. Campbell, Tennessee, February 9, 1814; A. J. Dallas, Pennsylvania, October 6, 1814; William H. Crawford, Georgia, October 22, 1816. *Secretary of War*, William Eustis, Massachusetts, March 7, 1809; John Armstrong, New York, January 13, 1813; James Monroe (acting), September 27, 1814; William H. Crawford, Georgia, August 1, 1815. *Secretary of the Navy*, Paul Hamilton, South Carolina, March 7, 1809; William Jones, Pennsylvania, January 12, 1813; B. W. Crowninshield, Massachusetts, December 19, 1814. *Attorney-General*, C. A. Rodney, continued; William Pinkney, Maryland, December 11, 1811; Richard Rush, Pennsylvania, February 10, 1814. *Postmaster-General*, Gideon Granger, continued; Return J. Meigs, Ohio, March 17, 1814.

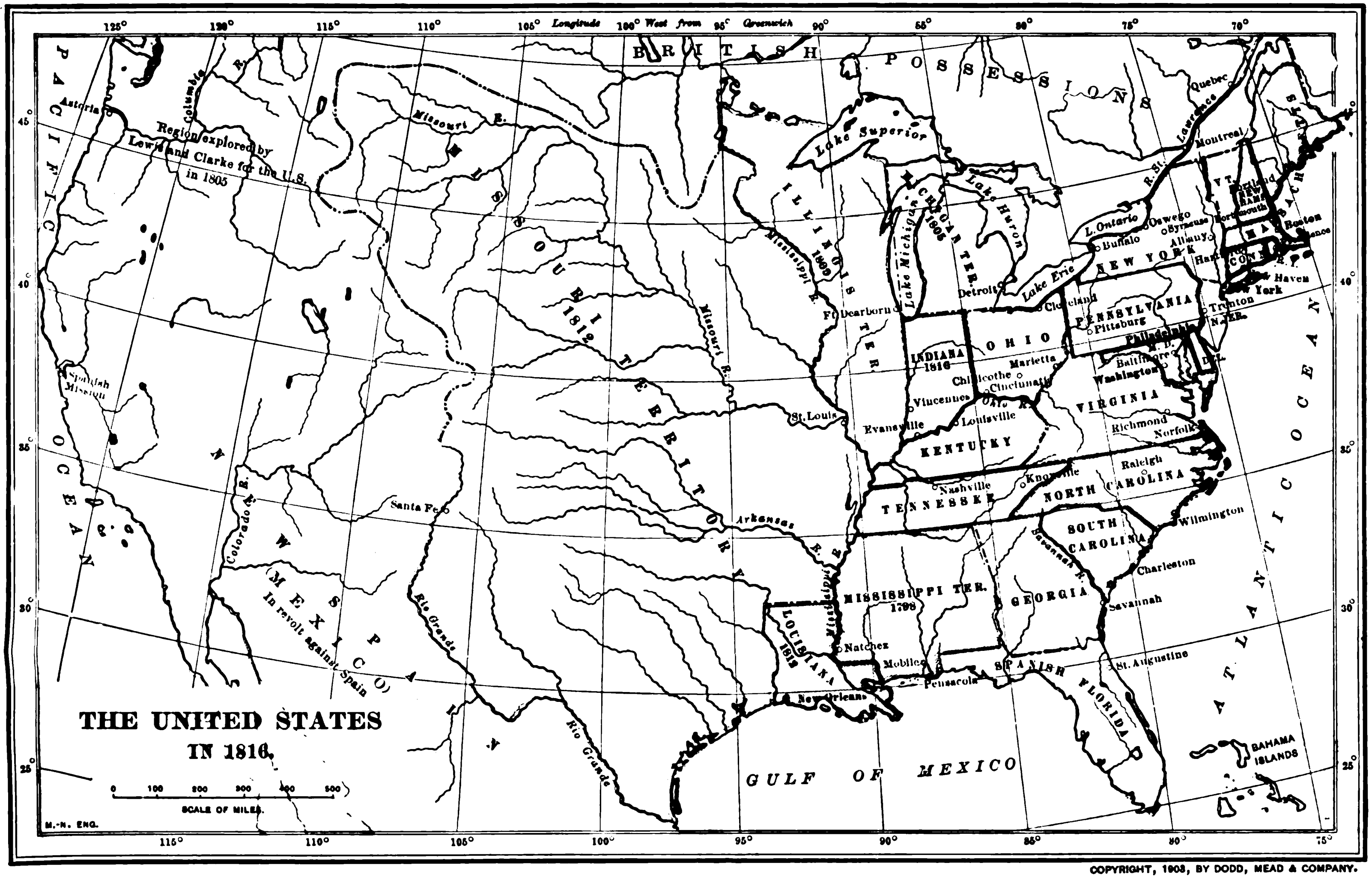
The beginning of Madison's administration witnessed a further straining of relations between the United States and England. Though the acts of France had been, in the main, no less unjust and arrogant than those of England, she had never attempted the impressment of American seamen, which had been made easy for England by identity of language and by the fact that, in some cases, British deserters were actually found upon American ships. Moreover, the Republican Party, now in power, had been traditionally the friend of France. Hence, as time went on, England was especially singled out for American dislike, and this feeling increased when the West complained that British agents were exciting disaffection on the frontiers and intriguing with the Indians, color being given to this latter charge by the hostility of some of the Indians and Tecumseh's attempt to form an Indian confederation. See TECUMSEH; TIPPECANOE, BATTLE OF.

In 1810 England and France each professed a readiness to repeal the decrees that had so hampered American commerce, if the other would do so first. France then revoked conditionally the Berlin and Milan decrees, and in 1812 revoked them unconditionally, dating the revocation back one year. Meanwhile, an aggressive element had risen to prominence in the councils of the Republican Party. Henry Clay, of Kentucky, was Speaker of the House, and John C. Calhoun, of South Carolina, on the floor of the House was the leader of the majority. Under the impulse of these two brilliant and impetuous spirits, the party in power became transformed into a war party. Acts were passed to enlist soldiers, to organize the militia, to enlarge the navy, and to prepare in every way for war. The adoption of a war policy was urged upon the President, who was himself reluctant to adopt it. England having refused to modify her policy toward neutrals, an embargo upon all American shipping was proclaimed for sixty days as a preliminary to the opening of hostilities; and on June 1st Madison sent a message to Congress in which, after reviewing the American grievances against England, he recommended a formal declaration of war. The chief grounds for this action, as given by Madison, were the impressment of American seamen, the extension of the right of search to United States war vessels, the 'paper blockades' established by the British Orders in Council, and the alleged efforts of Great Britain to persuade the Northwestern Indians to attack the Americans. On the 18th Congress formally declared war. Five days later, and before the declaration reached England, the British Government withdrew its objectionable Orders in Council, but although attempts were then made to restore peace, reconciliation at that time was impossible. The disparity in power between the United States and Great Britain at this time was enormous, and except that the latter was still engaged in her conflict with Napoleon, a declaration of war would have seemed little less than foolhardy. In 1810 the population of the United States was only about 7,250,000, while that of Great Britain was fully 18,500,000. Great Britain, moreover, had vastly superior resources at her disposal, was organized for war, while the United States was not, and, besides having a large and highly disciplined army, was the acknowledged mistress of the seas. In general, the war went against the Americans on land, though the British were decisively repulsed at New Orleans; and the warfare on sea demonstrated the superiority, vessel for vessel, of the American to the British navy. Gradually, however, by reason of her vastly larger fleet, Great Britain defeated the American vessels in detail or drove them under the shelter of forts. The American naval successes were, nevertheless, of such number and of such tactical importance as to add greatly to the standing of the United States as a naval power. Congress had voted to raise 25,000 enlisted soldiers, 50,000 volunteers, and 100,000 militia. General William Hull with 2000 men at Detroit invaded Canada, but on being met by a small force of British and Indians under General Brock, recrossed the river, and on August 16th surrendered at Detroit without resistance. A second invasion of Canada was made in October, 1812, near Niagara Falls, by General Van Rensselaer. One thousand American militia stormed the heights of Queenstown, and the British general, Brock, was killed, but reinforcements arriving, the heights were retaken, and the Americans were defeated with great loss, some of them surrendering. Some of the militia refused to cross into Canada, upon the ground that the Government had no right to send the militia across the frontier. The Federalist Party, opposed to the war, defended the doctrine, and General Van Rensselaer resigned in disgust.

American disasters on the land were, however, compensated for by victories at sea. On August 19th the United States frigate *Constitution* (q.v.) captured the British frigate *Guerrière;* on October 18th the *Wasp* (American) took the *Frolic* (British); on October 25th the *United States* captured the *Macedonian;* and on December 29th the *Constitution* took the *Java*. The Americans, in most cases, had the larger ships and heavier ordnance; but the immense disparity in the losses showed also superior seamanship and gunnery. American privateers, furthermore, took during the war, it is estimated, 300 British vessels and 3000 prisoners.

In May, 1812, Madison had been renominated for the Presidency, with Elbridge Gerry, of Massachusetts, as the Republican candidate for Vice-President. In the ensuing election Madison defeated De Witt Clinton by an electoral vote of 128 to 89, while Gerry defeated Jared Ingersoll by an electoral vote of 131 to 86.

In April, 1813, an American army of 1700 men under General Henry Dearborn captured York, now Toronto, and Dearborn having been relieved, Generals Wilkinson and Hampton undertook to capture Montreal, but met with no success. An attempt of the British general, Prevost, on Sackett's Harbor in May was repulsed; the British squadron on Lake Erie, consisting of 6 vessels



THE UNITED STATES IN 1816

COPYRIGHT, 1903, BY DODD, MEAD & COMPANY.

carrying 63 guns, was captured on September 10, 1813, by Commodore Perry at the head of an American flotilla of 9 vessels with 54 guns (see ERIE, BATTLE OF LAKE); and this latter success enabled General Harrison to invade Canada, where he defeated General Proctor in the battle of the Thames (October 5th), in which the great Indian warrior-chief Tecumseh was killed. During the same period General Andrew Jackson in Alabama and Georgia defeated the Creek Indians, who had been incited to make war upon the frontier settlements. In the summer of 1814 General Jacob Brown, with Colonel Winfield Scott as his second in command, crossed to the Canadian side, captured Fort Erie (q.v.) on July 2d, and defeated General Riall at Chippewa on July 5th. On July 25th the indecisive battle of Lundy's Lane was fought, the Americans being under the immediate command of Scott; and the American forces then withdrew to Fort Erie, where they were besieged. (See FORT ERIE.) General Wilkinson also invaded Canada along the Sorel River, but was easily repulsed. A British invasion, by Lake Champlain, under Prevost, with 14,000 men and a flotilla on the lake, ended disastrously. On September 11th the flotilla was signally defeated in the harbor of Plattsburg by an American squadron under Commodore McDonough, while the army was repulsed on shore, and retreated with heavy loss. In August a British fleet ascended Chesapeake Bay and landed troops which, after dispersing with little difficulty a force of American militia at Bladensburg (q.v.), entered Washington and burned the Government buildings. A subsequent attack on Baltimore was unsuccessful. New York, New London, and Boston were blockaded, and a large expedition was sent against Mobile and New Orleans.

On January 8, 1815, General Pakenham attacked New Orleans, but his army was repulsed with great loss by General Jackson at the head of an inferior militia force. (See NEW ORLEANS, BATTLE OF.) This action was fought two weeks after peace had been concluded by the commissioners of England and the United States.

From the middle of 1813 the fortunes of war alternated on the sea. On June 1, 1813, the American frigate *Chesapeake* was taken by the *Shannon* and the American sloop *Argus* by the *Pelican* on August 14th; the British brig *Boxer* was captured by the *Enterprise* on September 5, 1813; the American frigate *Essex*, after a memorable career under Porter, surrendered to the *Phœbe* and *Cherub* on March 28, 1814; the British brig *Epervier* was captured by the *Peacock* on April 29, 1814; the British sloop *Avon* was sunk by the *Wasp* on September 8, 1814; on January 15, 1815, after the conclusion of peace, the American frigate *President* was taken by the British; and on February 20th the American frigate *Constitution* captured the *Cyane* and the *Levant*.

In December, 1814, the Federalists of New England held a convention at Hartford in opposition to the war and the Administration. (See HARTFORD CONVENTION.) The treaty of peace concluded with England at Ghent on December 24, 1814 (see GHENT, TREATY OF), was announced in February, 1815. The terms did not include any affirmative withdrawal of England's claim to search American ships, but nevertheless all parties in the country approved it.

In 1815 Commodore Decatur commanded an expedition against the Algerians, whose corsairs had preyed on American commerce in the Mediterranean, and dictated terms to Algiers, Tunis, and Tripoli. See BARBARY POWERS, WARS WITH THE.

With the end of the War of 1812 came the virtual extinction of the Federalist Party, whose unpatriotic course during the struggle had made its name odious to the nation as a whole. It ceased, thereafter, to make itself felt in national affairs (see FEDERALISTS), and for a time the country had the singular fortune to find all its citizens of one party, with principles derived from both the old party creeds. Perhaps the most marked influence left by the Federalists upon the political tenets of their opponents, and upon the popular mind, was to be found in the now very general recognition of the broad powers of the Central Government. This national idea had sustained the Republicans in the more liberal view which the war had compelled them to take of the inherent powers of the Federal Government. The noticeable effect of the war period in strengthening the nationalist tendency was immediately illustrated by the granting of the charter of the second United States Bank (see BANK, BANKING) in 1816; by the passage of the first really protective tariff, under the guidance of Dallas, in the same year (see TARIFF); and by the activity of Congress in attempting to appropriate large amounts of the national funds for public roads and similar improvements of a local character, an important bill for this purpose, passed by Congress in 1816, being, however, vetoed by Madison on the ground of its unconstitutionality. The tendency was also emphasized by judicial decisions (as in *Martin* vs. *Hunter's Lessee*, 1816, and *Cohens* vs. *Virginia*, 1821), establishing the supremacy of the Federal judicial power over that of the States, while in *McCulloch* vs. *Maryland*, in 1819, Chief Justice Marshall introduced into the law of the land his advanced views as to the relation of the States to the Union and elaborated his theory of the supreme and exclusive authority of the latter. For the moment, the close of Madison's administration found the country, as a whole, scarcely divided by party differences, so that the Presidential election of November, 1816, resulted in the choice of James Monroe, of Virginia, as President, and Daniel D. Tompkins, of New York, as Vice-President, these candidates receiving 183 electoral votes, while the votes of only three States—Massachusetts, Connecticut, and Delaware—were cast for the Federalist candidate, Rufus King, of New York. The Federalists made no formal nomination for the office of Vice-President. In Madison's first administration Louisiana was admitted into the Union (1812), and in the second Indiana (1816).

VIII. and IX. ADMINISTRATION OF JAMES MONROE (1817-25). *Cabinet.—Secretary of State*, John Quincy Adams, Massachusetts, March 5, 1817. *Secretary of the Treasury*, William H. Crawford, continued. *Secretary of War*, George Graham, Virginia, April 7, 1817; John C. Calhoun, South Carolina, October 8, 1817. *Secretary of the Navy*, B. W. Crowninshield, continued; Smith Thompson, New York, November 9, 1818; John Rogers, Massachusetts, September 1, 1823; Samuel L. Southard, New Jersey, September 16,

1823. *Attorney-General*, Richard Rush, continued; William Wirt, Virginia, November 13, 1817. *Postmaster-General*, R. J. Meigs, continued; John McLean, Ohio, June 26, 1823.

The period of Monroe's term of office has been commonly known in American political history as the Era of Good Feeling. Party questions were in abeyance, and when, in May, 1817, the President began an extended tour in the Northern and Western States, the warmth of the welcome given him by all classes of the people showed that the nation was contented, prosperous, and loyal. In accordance with the recommendations of the President's first message, the slightly protective tariff of 1816 was continued for seven years. (See TARIFF.) On December 10, 1817, Mississippi was admitted to the Union. In 1818 (December 3d) Illinois became a State, and on February 22, 1819, the United States purchased from Spain for $5,000,000 the territory of east and west Florida (in which region hostilities had recently been carried on against the Seminole Indians), together with all the claims which Spain might have to territory as far west as the Pacific, north of the forty-second parallel, including, of course, the Oregon country; while the United States relinquished all claim to the province west of the Sabine River (Texas). This treaty, however, was not formally ratified until 1821. Early in 1818 the people of the Territory of Missouri (q.v.), which had been included in the Louisiana Purchase, applied for admission to the Union. A bill providing for such admission was framed, but amended in the House in such a way as to forbid slavery in the new State. As so amended, the bill passed the House by the votes of the members from the free States, but was defeated in the Senate. This action brought the question of slavery prominently into the sphere of national politics, never again to disappear until the extinction of that institution as the result of the war between the States in 1861-65. In the Congress which met in December, 1819, the question of the admission of Missouri was again brought forward, coupled with a proposition for the admission of Maine, which had hitherto been a part of Massachusetts. An arrangement known as the 'Missouri Compromise' (q.v.) was effected (1820) by the action of Clay and the conservative members of both sections, which provided that the admission of Maine and Missouri should be voted upon separately, that slavery should be permitted in Missouri, but that slavery should forever be prohibited in territories acquired from France north of the parallel of 36° 30′ except Missouri. Maine was admitted in 1820 and Missouri in 1821, the latter step having been delayed by a vigorous debate in Congress occasioned by a clause in the proposed State Constitution which prohibited the settling of free negroes in the State (see MISSOURI COMPROMISE), the Missouri Legislature finally pledging the State not to shut out any negro citizen of another State. At the same session of Congress, Alabama was admitted to the Union (December 14, 1819). In 1820 the Presidential campaign resulted in the reëlection of Monroe and Tompkins, Monroe receiving all the electoral votes but one, which was cast for John Quincy Adams.

In 1821 the strict constructionists among the Republicans defeated bills looking to a national canal system and a higher tariff, and the President vetoed a bill for the outlay of national funds upon the Cumberland Road (q.v.). In December, 1823, in his annual message to Congress, Monroe promulgated the famous declaration that has since been known as the Monroe Doctrine (q.v.). In 1824, the nationalist policy being then followed by a majority in both Houses, there was adopted a more strictly protective tariff, framed with the design of excluding foreign competitors from American markets (see TARIFF), while a bill for making surveys for a national canal system also became law. The political issues arising out of the founding of a new government as well as out of international complications had now lost their importance, and attention was becoming centred on internal matters, as to none of which were sectional or factional issues as yet clearly drawn, although the sudden introduction of the slavery question into Congressional politics was to acquire more significance than any other circumstance of the administration. However, as there was now only one political party, the Republican, the Presidental election of 1824 was largely a personal and factional contest. When the electoral votes were counted, 99 were for Andrew Jackson, of Tennessee; 84 for John Quincy Adams, of Massachusetts; 41 for William H. Crawford, of Georgia; and 37 for Henry Clay, of Kentucky; there being thus no choice for President, and the decision being thrown into the House of Representatives, where, by a coalition of the supporters of Clay and Adams, the latter was finally chosen, Adams receiving the votes of thirteen States, while Jackson had those of seven, and Crawford those of four. The electors had chosen John C. Calhoun, of South Carolina, to be Vice-President, by a vote of 182 to 78 for various other candidates.

X. ADMINISTRATION OF JOHN QUINCY ADAMS (1825-29). *Cabinet.—Secretary of State*, Henry Clay, Kentucky, March 7, 1825. *Secretary of the Treasury*, Richard Rush, Pennsylvania, March 7, 1825. *Secretary of War*, James Barbour, Virginia, March 7, 1825; Peter B. Porter, New York, May 26, 1828. *Secretary of the Navy*, S. L. Southard, continued. *Attorney-General*, William Wirt, continued. *Postmaster-General*, John McLean, continued.

A new division of the American people into parties dates from the beginning of this administration. The party previously known as Republican or Democratic-Republican soon took the name of Democratic (see DEMOCRATIC PARTY), while the Clay and Adams factions, which had been identified with the doctrine of loose construction, after taking the name of National Republican, changed it eventually to that of Whig (see WHIG PARTY), by which the party continued to be known for some twenty-five years. The basis for the new party division lay largely in the factional differences between the followers of Adams and those of Jackson, and one result of this was the prolonged controversy throughout the administration of Adams and the development of especially bitter relations between the factions of the leaders, which continued throughout the two terms of Jackson. Owing to the determined obstruction which was made by the opponents of the Administration, few of its measures were carried, so that the net results of the four years' work were comparatively slight, and the period became distinguished chiefly by the partisan conflicts preliminary to the overthrow of the Adams faction in 1828.

During the suspension of commerce by the War of 1812, large amounts of capital were withdrawn from trading ventures and diverted to manufacturing establishments, with the result that gradually New England and the Northern coast States ceased to be free-trade regions, and became desirous of a protective tariff policy, while the South arrayed itself on the side of free trade. Upon the return of peace, the new manufacturing establishments were not firmly enough established to compete successfully with the foreign manufacturers, and accordingly in 1824 an act was passed for the purpose of giving the control of the home market to the wool manufacturers. This failing of its purpose, a national convention of protectionists at Harrisburg, Pa., in July, 1827, advocated a strongly protective policy, and in 1828 a tariff framed in accordance with these views became law. The South denounced this measure as being sectional legislation, intended to benefit New England and the Middle States at the expense of the South, and the doctrine of Nullification (q.v.), which had been promulgated in the Kentucky Resolutions of 1798 (see VIRGINIA AND KENTUCKY RESOLUTIONS), and had been revived in South Carolina in 1827, began to be widely accepted in the Southern States. Adams's administration was further marked by the expenditure by the National Government of some $14,000,000 for 'internal improvements;' by the rapid immigration to the West, greatly promoted by the opening of the Erie Canal; and by the debates in Congress over the advisability of sending delegates to the Panama Congress (q.v.). In 1828 the Democratic candidate for President, Andrew Jackson, of Tennessee, received 178 electoral votes to 83 cast for John Quincy Adams; and John C. Calhoun was reëlected Vice-President, having 171 electoral votes. The accession of President Jackson was the beginning of a new era in political practice. A radical change was typified by the discontent with the existing methods, which led to the more direct participation of the public at large in political affairs through the rise of the nominating convention and through the practice of choosing Presidential electors by popular vote. This marked departure toward practical democracy was emphasized by the striking influence which the new Western States and their ideals and standards of life now secured over national politics.

XI. and XII. ADMINISTRATION OF ANDREW JACKSON (1829-37). *Cabinet.—Secretary of State,* Martin Van Buren, New York, March 6, 1829; Edward Livingston, Louisiana, May 24, 1831; Louis McLane, Delaware, May 29, 1833; John Forsyth, Georgia, June 27, 1834. *Secretary of the Treasury,* Samuel D. Ingham, Pennsylvania, March 6, 1829; Louis McLane, Delaware, August 8, 1831; William J. Duane, Pennsylvania, May 29, 1833; Roger B. Taney, Maryland, September 23, 1833; Levi Woodbury, New Hampshire, June 27, 1834. *Secretary of War,* John H. Eaton, Tennessee, March 9, 1829; Lewis Cass, Michigan, August 1, 1831; Benjamin F. Butler, New York, March 3, 1837. *Secretary of the Navy,* John Branch, North Carolina, March 9, 1829; Levi Woodbury, New Hampshire, May 23, 1831; Mahlon Dickerson, New Jersey, June 30, 1834. *Attorney-General,* John M. Berrien, Georgia, March 9, 1829; Roger B. Taney, Maryland, July 20, 1831; Benjamin F. Butler, New York, November 15, 1833. *Postmaster-General,** William T. Barry, Kentucky, March 9, 1829; Amos Kendall, Kentucky, May 1, 1835.

The bold, decisive, and impetuous character of President Jackson was shown in a general removal of those, down to small postmasters and tidewaiters, who had held office under the late Administration, and in the appointment of his own partisans. The administration was distinctively one of conflict, the chief issues being the United States Bank and the tariff; and Jackson was swayed throughout, to a considerable extent, by the influence of a group of friends, who became known collectively as the 'Kitchen Cabinet' (q.v.). South Carolina declared the high protective tariff acts of 1828 and 1832 to be unconstitutional, and therefore null and void, and threatened to withdraw from the Union if an attempt were made to collect the duties on foreign importations. The President prepared to execute the laws by force; Calhoun resigned his office of Vice-President, and in the Senate, to which he was promptly sent, asserted the doctrine of State rights, including the right of secession. (See NULLIFICATION.) A collision seemed imminent, but the affair was settled by a compromise bill, introduced by Henry Clay, providing for a gradual reduction of duties until 1842, when they were not to exceed 20 per cent. *ad valorem.* As an incident of this controversy, though nominally occasioned by a resolution calling for an inquiry into the sale of Government lands, occurred the famous debate (January, 1830) in the Senate between Daniel Webster (q.v.), of Massachusetts, and Robert Y. Hayne (q.v.), of South Carolina, in which the two opposing views regarding slavery, nullification, and the true interpretation of the Constitution were advocated and discussed with such eloquence, learning, and enthusiasm as to make the debate a landmark in the constitutional development of the United States. The same period witnessed the rise of the Anti-Masonic Party, based on opposition to Free Masonry and to secret societies generally. See MORGAN, WILLIAM; ANTI-MASONS.

The President was a pronounced opponent of the national bank, the existence of which under its second charter was to continue to 1836. Jackson early raised the issue of its constitutionality, whereupon the friends of the bank introduced and carried through both Houses a bill for its continuation. This was vetoed, and its supporters were unable to carry the bill over the veto. The question, however, was made the chief issue in the campaign of 1832, in which the decisive triumph of Jackson was taken by him to be a vindication of his policy and an assurance that he represented the popular will more accurately even than did Congress. The result was still further to strengthen his position and to increase his influence over Congressional action. In the election of 1832 he received 219 electoral votes, as against only 49 for Henry Clay, 11 for John Floyd, of Virginia, and 7 for William Wirt, of Virginia. Martin Van Buren was elected Vice-President, receiving 189 votes.

The Cherokee Indians in Georgia, who had attained to a certain degree of civilization, appealed to the President for protection against the seizure of their lands by the State; but they were told that he "had no power to oppose the exercise of the sovereignty of any State over all who may be within its limits;" and the Indians were obliged to remove to the territory set apart for them west of the Mississippi. In 1832, in the West, trouble with the Indians had culminated in the Black Hawk War (see Black Hawk), and now in 1835 the Seminole War broke out in Florida, and a tribe of Indians, insignificant in numbers, under the crafty leadership of Osceola (q.v.), kept up hostilities for years, at a cost to the United States of several thousands of men and some $50,000,000. The removal in 1835 by order of the President of the Government deposits from the United States Bank to certain State banks, led to the weakening of the bank, and, after some years, to the adoption of Van Buren's plan of an independent treasury. Later the Senate, which was controlled by the Whigs, as Jackson's opponents now styled themselves, led by Henry Clay, took the extraordinary step of passing formal resolutions of censure of the President for his order removing the Government deposits from the bank. The President protested against the resolution, but the protest was not allowed by the Senate to appear upon the record. The warfare between the President and Senate continued through the next two years, the latter frequently rejecting the nominations made by the Executive. In 1837, however, largely under the influence of Benton, the Senate, which had at last become Democratic, voted to expunge from its records the resolutions of censure already mentioned. In 1835 (December 7th) the President announced to Congress that the national debt would soon be paid, and that provision should be made for the surplus revenue which was anticipated. In June, 1836, a bill was passed providing that after January 1, 1837, any surplus exceeding the sum of $5,000,000 should be divided among the States as a loan, subject to a recall by Congress; and in accordance with this act, some $28,000,000 was divided in 1837, which has never been recalled. In July, 1836, the President caused the famous Specie Circular to be issued, which ordered the agents of the Government to receive only gold or silver in payment for public lands.

---

* The Postmaster-General first came to be a regular member of the Cabinet in Jackson's administration.

At this time Texas, which had been colonized by Americans, was endeavoring to free itself from Mexican control and to establish its independence. The South saw in the movement a prospect of annexing this large territory to the United States, and of carving from it new slave States whose votes in the Senate would counterbalance those of the new free States. Many manifestations of sympathy with the Texans were therefore made, and a resolution recognizing the independence of Texas passed the Senate, but not the House. A new era in the slavery controversy had been inaugurated with the establishment of the *Liberator* by Garrison in 1831. The New England Anti-Slavery Society was organized in 1832, and the American Anti-Slavery Society at Philadelphia in 1833. (See Slavery; Garrison, W. L.; Phillips, Wendell; Abolitionists; Gag Rules.) Arkansas (June 15, 1836) and Michigan (January 26, 1837) were admitted to the Union. The administration of Jackson was further marked by the political acerbities growing partly out of the Peggy O'Neill affair (see Eaton, Margaret), and leading to the reorganization of the Cabinet, by the treaty with France settling the spoliation claims and the treaty with England securing unrestricted direct trade with the British West Indies, by the adoption on a large scale by Jackson of the 'spoils system,' and by the introduction of railroads. The election of 1836 resulted in the success again of the Democratic Party, whose candidate for President, Martin Van Buren, of New York, received 170 electoral votes, against 73 for William Henry Harrison, of Ohio, and 51 scattering. No candidate for Vice-President received a clear majority, and so the Senate elected Richard M. Johnson (q.v.), of Kentucky.

XIII. Administration of Martin Van Buren (1837-41). *Cabinet.—Secretary of State,* John Forsyth, continued. *Secretary of the Treasury,* Levi Woodbury, continued. *Secretary of War,* Joel R. Poinsett, South Carolina, March 7, 1837. *Secretary of the Navy,* Mahlon Dickerson, continued; James K. Paulding, New York, June 25, 1838. *Attorney-General,* Benjamin F. Butler, continued; Felix Grundy, Tennessee, July 5, 1838; Henry D. Gilpin, Pennsylvania, January 11, 1840. *Postmaster-General,* Amos Kendall, continued; John M. Niles, Connecticut, May 19, 1840.

Van Buren, in accordance with his pledges, carried out and perpetuated the policy of his predecessor. The new Administration was unfortunate in its beginnings. A financial disaster, such as had not until then been known in the United States, swept over the country in 1837. A general suspension of specie payments occurred; many banks suspended altogether, and innumerable corporations and individuals were ruined. Congress authorized the issue of $10,000,000 in treasury notes, and Jackson's Specie Circular was revoked. Van Buren's administration was marked by the establishment of the independent treasury system (reëstablished in 1846), by a renewal of hostilities against the Seminole Indians, and by the establishment of regular steamship communication with Europe. The Democrats with difficulty retained control of the House of Representatives, and through such methods as to decrease public confidence in the party leaders. This, together with the prevalent depression in business, weakened the dominant party in the country at large, so that in the campaign of 1840 the candidacy of the Whig nominee, General William Henry Harrison (q.v.), of Ohio, was supported with an enthusiasm such as no subsequent political campaign has ever witnessed. It has become known as the 'Log Cabin Campaign' and the 'Hard Cider Campaign,' from the prevalent symbols of the homely and simple frontier life of General Harrison. The 'Liberty Party' (q.v.) also made nominations, their candidates being James G. Birney (q.v.), of New York, for President, and Francis Lemoyne, of Pennsylvania, for Vice-President. The Democrats renominated Van Buren, but the convention did not agree upon the choice of a candidate for the Vice-Presidency. General Harrison received 234 electoral votes, to 60 for Van Buren; and for Vice-President the Whig, John Tyler, of Virginia, received 234, against 48 for R. M. Johnson and 12 scattering.

XIV. Administration of William Henry Harrison (1841) and of John Tyler (1841-45).

Cabinet.—*Secretary of State*, Daniel Webster, Massachusetts, March 5, 1841; Hugh S. Legaré, South Carolina, May 9, 1843; A. P. Upshur, Virginia, July 24, 1843; John C. Calhoun, South Carolina, March 6, 1844. *Secretary of the Treasury*, Thomas Ewing, Ohio, March 5, 1841; Walter Forward, Pennsylvania, September 13, 1841; John C. Spencer, New York, March 3, 1843; George M. Bibb, Kentucky, June 15, 1844. *Secretary of War*, John Bell, Tennessee, March 5, 1841; John McLean, Ohio, September 13, 1841; John C. Spencer, New York, October 12, 1841; James M. Porter, Pennsylvania, March 8, 1843; William Wilkins, Pennsylvania, February 15, 1844. *Secretary of the Navy*, G. E. Badger, North Carolina, March 5, 1841; A. P. Upshur, Virginia, September 13, 1841; David Henshaw, Massachusetts, July 24, 1843; T. W. Gilmer, Virginia, February 15, 1844; John Y. Mason, Virginia, March 14, 1844. *Attorney-General*, John J. Crittenden, Kentucky, March 5, 1841; Hugh S. Legaré, South Carolina, September 13, 1841; John Nelson, Maryland, July 1, 1843. *Postmaster-General*, Francis Granger, New York, March 6, 1841; Charles A. Wickliffe, Kentucky, September 13, 1841.

Two weeks after his inauguration, President Harrison issued a proclamation calling an extra session of Congress to consider the financial distress prevailing throughout the country and other questions that beset the Government. The extra session was called for May 31st, but on April 4th the President died after a short illness. The new President, John Tyler, retained for a few months his predecessor's Cabinet. When Congress met in accordance with General Harrison's call of March 17th, the Whigs, who had a majority in both Houses, began to carry out the changes to which their party had pledged itself in the campaign of the preceding year. A bill was passed for the incorporation of a new United States Bank, to be called the 'Fiscal Bank of the United States,' planned somewhat after the model of that which had been so vigorously attacked by President Jackson. To the consternation of the Whigs, the new President on August 16th vetoed it as being unconstitutional, since it provided for the establishment of branches of the bank in the various States without securing the prior consent of these States. The leading members of the party then conferred with President Tyler and asked him to suggest the provisions of a bill that he would be willing to accept. He agreed to do so, yet after the bill framed largely in accordance with his own ideas had passed the two Houses (September 3d) it promptly met the fate of the former act. It now became evident that the President was at heart a Democrat, and that his political principles would prevent him from acting cordially with the party that had elected him to office. The indignation and chagrin of the Whigs was unbounded. The entire Cabinet with one exception immediately resigned, Webster remaining in the State Department until pending negotiations with England had been completed. On September 11th the leaders of the Whig Party issued a manifesto 'reading' the President out of the party, and holding him responsible for the failure to effect the reforms that had been promised. President Tyler immediately filled the places in his Cabinet with conservative politicians, and having been cut off from political affiliation with his own party, turned to the Democrats for support.

During Tyler's administration the relations between the United States and Great Britain became very strained. In the course of an insurrection in Canada in 1837 a party of supporters of the Canadian Government had crossed over to the American territory and destroyed a vessel, the *Caroline*, owned by the friends of the insurgents. In the affair one American had been killed. In 1840 one Alexander McLeod, who had come to New York State and boasted of having taken part in the destruction of the *Caroline*, was arrested and indicted for murder. England protested vigorously and serious international complications for a time seemed imminent. (See CAROLINE.) Again, in October, 1841, the British freed most of the slaves aboard an American vessel, the *Creole*, which had been seized by them and carried into a port in the Bahamas. (See CREOLE CASE.) Thus each nation had a grievance against the other, and such ill feeling resulted that war was feared.

Fortunately, Webster, Tyler's Secretary of State, was liked and respected by English statesmen, and upon the reorganization of the Cabinet he retained his office until the pending negotiations were concluded. In 1842 Lord Ashburton was sent out from England to negotiate a treaty, with particular reference to adjusting the boundary between Canada and the Northeastern States. The boundary question was settled by a compromise, though Great Britain gave up the larger and more valuable share of the disputed territory. Two other points of importance were settled by this treaty. One was the agreement of the two governments looking to the suppression of the slave trade. The other was the provision for mutual surrender of criminals. The treaty was concluded on August 9, 1842, and was proclaimed on November 10th. See NORTHEAST BOUNDARY DISPUTE; WEBSTER-ASHBURTON TREATY.

In 1843 the Government arranged a treaty with the new Republic of Texas (q.v.), providing for the future annexation of that country to the United States. The Senate rejected this treaty by a vote of 35 to 16, seven Democrats voting with the Whigs for rejection. The problem of the future relations with Texas became still more critical in national politics, and its immediate importance was increased by the strong desire for annexation among the Southern leaders. To maintain the *status quo*, the annexation of Texas became an actual necessity to the interests of the South; for should the free States ultimately acquire a dominant power in the Senate, as they had already done in the House, the time might come when the existence of slavery would be imperiled. The possibility of this was kept continually before the Southern mind by the increasing activity in the North of the Liberty Party (q.v.), which in 1843 held a national convention at Buffalo and there put forth a series of resolutions denouncing slavery, and calling on the free States to pass penal laws to prevent the return of fugitive slaves, and which again nominated James G. Birney for the Presidency. The Whigs at their convention held at Baltimore in May, 1844, nominated Henry Clay, of Kentucky, with Theodore Frelinghuysen, of New York, as the candidate for Vice-President. The Democratic convention, in the same month, nominated James K. Polk, of Tennessee, and George M. Dallas, of Pennsylvania, and adopted a platform calling for the 'reannexation of Texas' and the 'reoccupation of Oregon.' The position of Clay as to the annexation of Texas was so equivocal as to arouse the suspicion of many Northerners, while the position of the Democrats on the Oregon question helped them in the Northwestern States. The election resulted in the choice of Polk and Dallas after a very close contest in which the Democrats succeeded only by the fact that several thousand votes in New York were cast for the anti-slavery ticket.

At the next session of Congress a joint resolution for the annexation of Texas was passed early in 1845 by both Houses and approved on March 1st by the President. It renewed the features of the Missouri Compromise as regards the Texan territory north of the compromise line, and as to the territory south of that line the question of slavery was left to the decision of the inhabitants of the States to be formed out of Texas.

Tyler's administration was marked by the 'Dorr Rebellion' in Rhode Island (see Dorr, Thomas W.; Rhode Island), by anti-rent disturbances in New York (see Anti-Rentism), and by the construction under the direction of S. F. B. Morse (q.v.) of the first successful long-distance telegraph line (1844).

XV. Administration of James K. Polk (1845-49). *Cabinet.—Secretary of State,* James Buchanan, Pennsylvania, March 6, 1845. *Secretary of the Treasury,* Robert J. Walker, Mississippi, March 6, 1845. *Secretary of War,* William L. Marcy, New York, March 6, 1845. *Secretary of the Navy,* George Bancroft, Massachusetts, March 10, 1845; John Y. Mason, Virginia, September 9, 1846. *Attorney-General,* John Y. Mason, Virginia, March 5, 1845; Nathan Clifford, Maine, October 17, 1846. *Postmaster-General,* Cave Johnson, Tennessee, March 6, 1845.

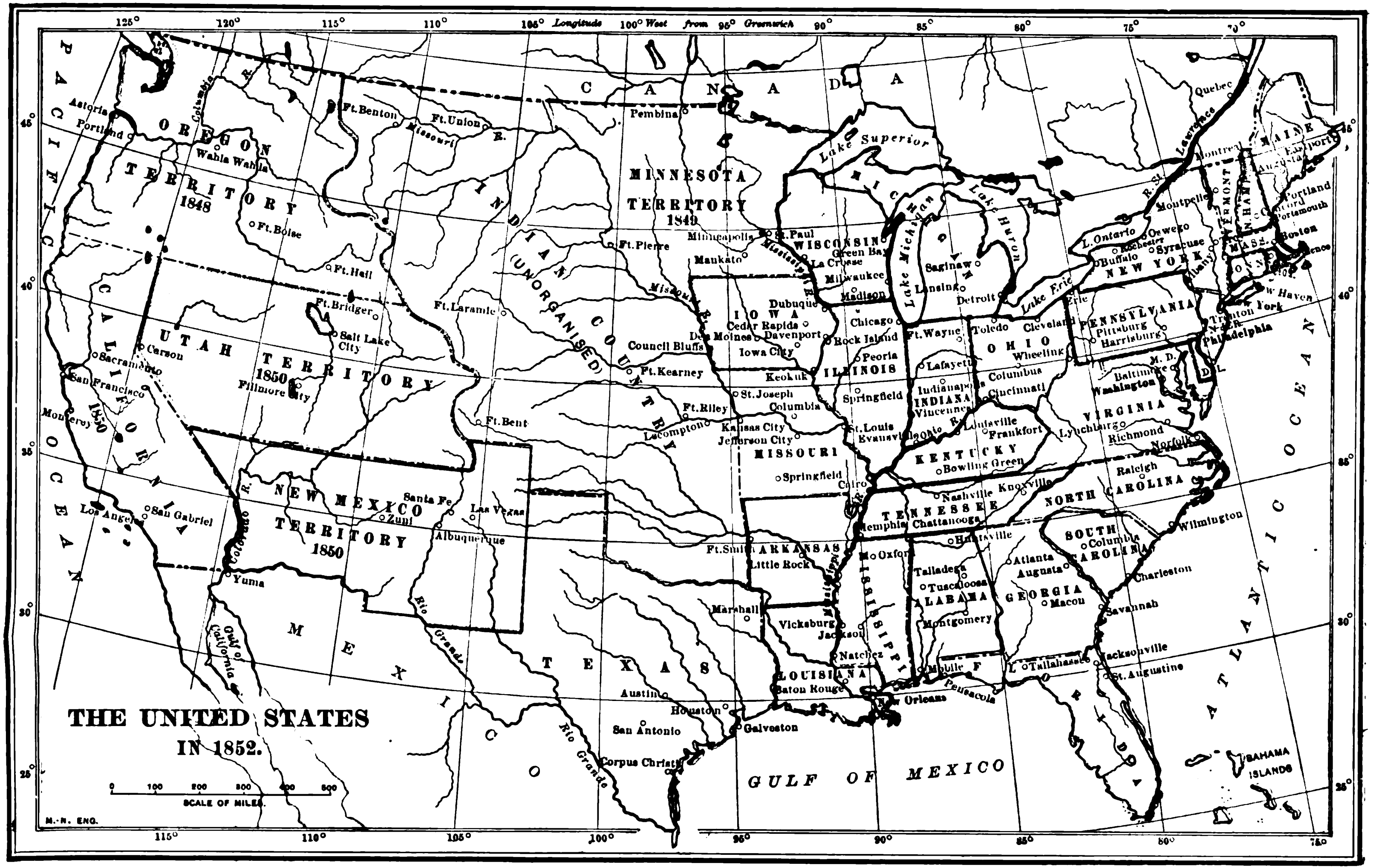
Soon after the beginning of Polk's administration United States troops under General Taylor were sent across the Nueces River to Corpus Christi, in territory then in dispute between the United States and Mexico, the United States claiming the Rio Grande as the boundary of Texas, and Mexico claiming the Nueces. In the meantime, both the Texan Congress (on June 18, 1845) and a convention of the people (on July 4th) had ratified the act of annexation, and on December 29th Texas formally entered the Union. Up to this date Mexico, being distracted by revolutions, had simply protested against the action of the United States and had recalled her Minister from Washington; but in the spring of 1846 the further advance of General Taylor toward the Rio Grande brought United States troops into conflict with the Mexicans, a small engagement taking place on April 24th. The Mexicans were then defeated at Palo Alto on May 8th, and on the following day at Resaca de la Palma. On May 11, 1846, news of the hostilities on April 24th having reached Washington, the President officially informed Congress of the occurrence and asked that war be declared. Both Houses responded to the message and to the awakened war spirit of the country by passing a bill (on May 13th) whose preamble began as follows: "Whereas, by the act of Mexico, a state of war exists between that Government and the United States"—a statement that provoked much criticism from the opponents of the Administration, as false, in view of the fact that hostilities had been precipitated by the military occupation of territory claimed by Mexico. The bill appropriated $10,000,000 for the prosecution of the war, and under it enlistment was actively begun. Volunteers to the number of 50,000 men were authorized. On May 23d Mexico formally declared war upon the United States. Whatever view one might take of the political aspect of the war, the brilliant series of victories aroused widespread enthusiasm and pride; as against forces that outnumbered them, sometimes four to one and not inferior in training, in a hostile country, and against formidable obstacles, both natural and artificial, the troops of Taylor and Scott won successive triumphs by the most splendid courage and the most stubborn fighting. For a detailed account, see Mexican War.

On February 2, 1848, peace was signed at Guadalupe Hidalgo (q.v.). Mexico resigned her claim to Texas, agreeing to the Rio Grande as the boundary, and also ceded New Mexico and Upper California to the United States for a payment of $15,000,000, the completion being thus attained of that great westward movement which had been going on since the Revolution.

Other important events of Polk's administration were the treaty with England (June 15, 1846) by which the long-disputed question of the northwest boundary was settled (see Northwest Boundary Dispute; Oregon); the so-called 'Tariff of 1846' (see Tariff), which limited its purpose to the collection of revenues alone, without protection to native industries; the reënactment (1846) of the Independent Treasury Act; the introduction of the Wilmot Proviso (q.v.); the formation of the Free-Soil Party; the admission of Iowa (December 28, 1846); the establishment of the new Territory of Oregon without slavery, and the admission of Wisconsin (May 29, 1848). It was during Polk's term also that in 1848 gold was discovered in California, that the sewing machine was patented (1846) by Elias Howe, and that the use of anæsthetics was introduced in surgery. It was at this time that the great flood of Irish immigration consequent upon the potato famine of 1846 began.

The opposing candidates at the Presidential election of 1848 were Lewis Cass (q.v.), of Michigan, and William O. Butler, of Kentucky, Democrats, against General Zachary Taylor, of Louisiana, and Millard Fillmore, of New York, Whigs, the newly-organized Free-Soil Party (q.v.) nominating Martin Van Buren, of New York, and Charles Francis Adams, of Massachusetts. Taylor and Fillmore received 163 electoral votes, as against 127 cast for Cass and Butler, the Democratic vote being reduced by the support given by the Barnburners (q.v.) in New York to Van Buren.

XVI. Administration of Zachary Taylor (1849-50) and of Millard Fillmore (1850-53). *Cabinet.—Secretary of State,* John M. Clayton, Delaware, March 7, 1849; Daniel Webster, Massachusetts, December 6, 1852. *Secretary of the Treasury,* W. M. Meredith, Pennsylvania, March 8, 1849; Thomas Corwin, Ohio, July 23, 1850. *Secretary of War,* George W. Crawford, Georgia, March 8, 1849; Winfield Scott (ad interim), July



THE UNITED STATES IN 1852.

COPYRIGHT, 1903, BY DODD, MEAD & COMPANY.

23, 1850; Charles M. Conrad, Louisiana, August 15, 1850. *Secretary of the Navy,* William B. Preston, Virginia, March 8, 1849; William A. Graham, North Carolina, July 22, 1850; J. P. Kennedy, Maryland, July 22, 1852. *Secretary of the Interior,* Thomas H. Ewing, Ohio, March 8, 1849; A. H. H. Stuart, Virginia, September 12, 1850. *Attorney-General,* Reverdy Johnson, Maryland, March 8, 1849; John J. Crittenden, Kentucky, July 22, 1850. *Postmaster-General,* Jacob Collamer, Vermont, March 8, 1849; Nathan K. Hall, New York, July 23, 1850; S. D. Hubbard, Connecticut, August 31, 1852.

The course of American political history from the beginning of this administration down to the Civil War is marked by a gradual disintegration of the old Whig Party (q.v.), the increase in importance of the free-soil movement, culminating in the formation of the Republican Party, and the development of the Democratic Party into an organization whose foremost object, in so far as it was under the control of the Southern wing, was the maintenance of slavery and the perpetuation of the political power in the slave States. The increase of territory out of which new States might be created made the South anxious to prevent these new States from inhibiting slavery, as would probably be done in some of them, especially in California, if the question were left to the inhabitants. The contest began actively in 1846, while the acquisition of the land in question was still doubtful. In that year David Wilmot, a Representative from Pennsylvania, brought forward a resolution providing that slavery should be excluded from all territories that might be acquired from Mexico. This, commonly called the 'Wilmot Proviso,' was carried in the House of Representatives, but was defeated in the Senate. (See WILMOT PROVISO.) So fierce did the strife become that many of the most thoughtful statesmen began to fear secession or civil war. In this crisis Clay, now a man of seventy-two and in broken health, came forward in 1850 as a peacemaker. Like Webster, who now vigorously supported him, Clay had always held a moderate position between the two extreme parties in the slavery controversy. His proposal was that no legislation concerning slavery in California, about to be admitted as a State, and in the new Territories should be enacted by Congress. He also proposed that the slave trade should be abolished in the District of Columbia, but that a stricter law for the rendition of fugitive slaves should be enacted. In September, 1850, Clay's scheme, with important changes, was put into effect by Congress by the enactment of the so-called 'Compromise Measures of 1850.' The passage, however, of the new Fugitive Slave Law excited at the North feelings of repugnance and disgust; and several of the State Legislatures even passed laws, commonly known as 'Personal Liberty Laws,' intended especially for the protection of negroes. (See COMPROMISE MEASURES OF 1850; FUGITIVE SLAVE LAW.) Such incidents as the rescue of the negro named 'Jerry' at Syracuse, N. Y., and the increased activity of the 'Underground Railroad' (q.v.) emphasized the difficulty of the situation and embittered the feelings of the South.

President Taylor died on July 9, 1850. His successor, Millard Fillmore, strictly carried out the policy of his party. The Compromise Measures were approved by the new President and their final adoption caused a temporary lull in the contest over the question of slavery.

During this administration was concluded (April 19, 1850) the Clayton-Bulwer Treaty (q.v.), respecting an interoceanic canal.

In June, 1852, the two great parties made their Presidential nominations. The candidates of the Democracy were Franklin Pierce, of New Hampshire, and William R. King, of Alabama; the Whigs nominated General Winfield Scott, of Virginia, and William A. Graham, of North Carolina. Each of the leading parties adopted a platform which recognized the 'finality' of the Compromise of 1850. In August the Free-Soil Party nominated John P. Hale, of New Hampshire, and George W. Julian, of Indiana. The election resulted in the success of the Democratic ticket, which received 254 electoral votes, against 42 cast for the Whig nominees. The years of this administration were marked by the deaths of three of the most influential political leaders, Calhoun (March 31, 1850), Clay (June 29, 1850), and Webster (October 23, 1852).

XVII. ADMINISTRATION OF FRANKLIN PIERCE (1853-57). *Cabinet.—Secretary of State,* William L. Marcy, New York, March 7, 1853. *Secretary of the Treasury,* James Guthrie, Kentucky, March 7, 1853. *Secretary of War,* Jefferson Davis, Mississippi, March 7, 1853. *Secretary of the Navy,* James C. Dobbin, North Carolina, March 7, 1853. *Secretary of the Interior,* Robert McClelland, Michigan, March 7, 1853; Jacob Thompson, Mississippi, March 6, 1856. *Attorney-General,* Caleb Cushing, Massachusetts, March 7, 1853. *Postmaster-General,* James Campbell, Pennsylvania, March 7, 1853.

In spite of the 'finality' planks in the Presidential campaign, the question of slavery soon came once more to the front. The leader in reviving the struggle was Stephen A. Douglas (q.v.), by whom, in January, 1854, the Kansas-Nebraska Bill was introduced into Congress. This divided the territory previously known as Nebraska into two Territories, one between parallels 37° and 40° to be called Kansas and the other between 40° and 43° to be called Nebraska. In both of these Territories, by the Missouri Compromise of 1820, slavery was prohibited; but the bill now introduced was framed upon the theory that the Missouri Compromise had been repealed by the Compromise of 1850, in spirit at least, and accordingly in the bill it was left to the people of each new Territory to determine whether or not slavery should be tolerated on its soil. The Senate promptly passed this bill, and two months later it was passed by the House. (See KANSAS-NEBRASKA BILL; POPULAR SOVEREIGNTY.) This led to the final disruption of the old Whig Party. A new party, based on opposition to slavery, now arose in the North, whose members at first generally styled themselves 'Anti-Nebraska Men,' and which soon developed into the Republican Party (q.v.). It was composed of men opposed to the extension of slavery without regard to former party affiliations—Whigs, Democrats, Know-Nothings, and Free-Soilers. The bulk of the Southern Whigs for the time being became Know-Nothings. The so-called American Party, or Know-Nothings, who about this time began to exercise great influence, demanded especially more stringent naturalization laws and the election to high office of none but native-born citizens.

This virtual repeal of the Missouri Compromise, which left the new Territories to decide for themselves whether they would admit slavery or not, turned Kansas, as the Territory nearest the settled States, into a battleground for the two parties. The partisans of the North and those of the South kept pouring in fresh immigrants to outnumber the other side. At first the South was successful, and a code of laws was established with many and stringent provisions in behalf of slavery, although this was brought about, not by legitimate immigrants, but chiefly by a mob of Missourians, who passed across the border, took possession of the polling places, and carried the elections. A succession of outrages, amounting to civil war, followed, each faction establishing its own Government and electing its delegate to Congress. President Pierce issued a proclamation (February 11, 1856) calling for obedience to the laws and a cessation of violence and interference. Civil war, however, actually existed in Kansas. The two anti-slavery towns, Lawrence and Osawatomie, were sacked, and the Free-Soil Legislature was twice dispersed. The outrages continued and no solution of the problem was reached during this administration. (See KANSAS.) In the meantime, public sentiment was excited to a still greater intensity by the assault upon Senator Charles Sumner (q.v.), of Massachusetts, by Preston S. Brooks (q.v.), of South Carolina (May 22, 1856).

In diplomacy during this administration friction arose between the United States and Austria over the Koszta affair (q.v.), and an important treaty was negotiated by Commodore Perry with Japan, by which intercourse was first opened between that country and the Western world.

In the Presidential election of 1856 the following tickets were in the field: Democratic, James Buchanan, of Pennsylvania, and John C. Breckenridge, of Kentucky; Republican, John C. Frémont, of California, and William A. Dayton, of New Jersey; Know-Nothing, Millard Fillmore, of New York, and A. J. Donelson, of Tennessee. The Democratic ticket received 174 electoral votes, the Republican 114, the Know-Nothing 8.

XVIII. ADMINISTRATION OF JAMES BUCHANAN (1857-61). *Cabinet.—Secretary of State*, Lewis Cass, Michigan, March 6, 1857; J. S. Black, Pennsylvania, December 17, 1860. *Secretary of the Treasury*, Howell Cobb, Georgia, March 6, 1857; Philip F. Thomas, Maryland, December 12, 1860; John A. Dix, New York, January 11, 1861. *Secretary of War*, John B. Floyd, Virginia, March 6, 1857; Joseph Holt, Kentucky, January 18, 1861. *Secretary of the Navy*, Isaac Toucey, Connecticut, March 6, 1857. *Secretary of the Interior*, Jacob Thompson, Mississippi, March 6, 1857. *Attorney-General*, J. S. Black, Pennsylvania, March 6, 1857; E. M. Stanton, Pennsylvania, December 20, 1860. *Postmaster-General*, Aaron V. Brown, Tennessee, March 6, 1857; Joseph Holt, Kentucky, March 14, 1859; Horatio King, Maine, February 12, 1861.

Two days after Buchanan's inauguration, the Supreme Court rendered its decision in the famous Dred Scott Case (q.v.), in which the majority of the justices held that Congress had no right to prohibit slavery in any Territory, and that slaves themselves were mere property whose secure possession in any Territory of the Union was guaranteed by the Constitution.

Events now succeeded one another with exciting rapidity. The sympathizers with the South had made various attempts to extend the area of slavery by the acquisition of Cuba. In 1854 the American ministers to England, France, and Spain met at the Belgian town of Ostend and there issued the so-called Ostend Manifesto (q.v.) to the effect that under certain contingencies the safety of the United States would demand the annexation of Cuba. Another attempt to acquire slave territory was through filibustering expeditions, the most famous of which were that of Lopez to Cuba in 1851 and that of William Walker (q.v.) from 1855 to 1858 to Central America. Even the reopening of the African slave trade began to be discussed.

In December, 1857, the pro-slavery party in Kansas held a convention at Lecompton and proceeded to impose slavery upon the future State by submitting to the voters the alternative of voting for the Constitution *with* slavery or the Constitution *without* slavery, the instrument itself, however, affirming the right to the ownership of slaves at the time within the Territory. The anti-slavery party, whose 'Topeka Constitution' had previously been disallowed by the Federal Government, generally abstained from voting, with the result that the Constitution *with* slavery was adopted. (See LECOMPTON CONSTITUTION.) A new Territorial Legislature with an anti-slavery majority ordered a new election, at which the Constitution was to be accepted or rejected. It was rejected (January, 1858). The National Congress passed a bill resubmitting the Lecompton Constitution to the vote of the people, its adoption to be followed by the immediate admission of Kansas as a State. They rejected it, and thus Kansas remained a Territory. In 1859 a new convention adopted another Constitution, known as the Wyandotte Constitution, prohibiting slavery, and this, being submitted to the people, was adopted by them. Kansas, however, was not admitted as a State until 1861. The controversy in Congress over the admission of Kansas under the Lecompton Constitution proved an event of momentous importance as leading up to the division of the Democratic Party in the Presidential campaign of 1860. Minnesota was admitted in May, 1858, and Oregon in February, 1859. In 1858 a marked impression was caused by the publication of Helper's *Impending Crisis*. (See HELPER, HINTON ROWAN.) In the following year occurred John Brown's raid on Harper's Ferry (q.v.). (See BROWN, JOHN). The South approached the campaign of 1860 with the conviction that there was no place for the South in an anti-slavery Union, and that the success of the Republicans, even though the Republican Party did not mean to interfere with slavery in the States, would mean an anti-slavery Union.

In the Presidential election of 1860 the situation was more complicated than ever before, and finally there appeared four tickets in the field. The Northern Democrats (see DEMOCRATIC PARTY) nominated Stephen A. Douglas, of Illinois, and Herschel V. Johnson, of Georgia; the Southern Democrats, who had seceded from the Democratic convention, nominated John C. Breckenridge, of Kentucky, and Joseph Lane, of Oregon; a third party, the so-called Constitutional Union Party (q.v.), composed of conservative members of the old Whig and Know-Nothing parties, especially powerful in the South, nominated John Bell, of Tennessee, and Edward Everett, of Massachusetts; while the Republicans (see Republican Party) nominated Abraham Lincoln, of Illinois, and Hannibal Hamlin, of Maine. The Republican platform declared in favor of freedom in the Territories, a protective tariff, internal improvements, and a Pacific railway. In the ensuing election Lincoln received 180 electoral votes and was elected. He received every Northern vote in the electoral college, excepting three out of the seven cast by New Jersey. Breckenridge received 72 electoral votes of the South. Bell received the votes of Kentucky, Tennessee, and Virginia, 39 altogether. Douglas received only the nine votes of Missouri and three of the votes of New Jersey. The North and South were arrayed against each other, and the South was beaten. Of the popular vote, Lincoln received 1,866,452; Douglas, 1,375,157; Breckenridge, 847,953; Bell, 590,631. Thus while Lincoln gained an overwhelming majority of the electoral votes, the combined Democratic votes exceeded his by 356,658, and the popular votes against him all together exceeded his own by 947,289. In the Southern States alone, the combined vote of two of the 'Union' candidates, Douglas and Bell, exceeded the vote of the disunion candidate, Breckenridge.

There was some ground for the claim that Lincoln was a 'minority President,' but the true significance of the election was the fact that political power had finally departed from the South. The slave States were at last confronted by an overwhelming opposition. The following figures from the census of each decade up to 1860 show the gradual growth of the power of the free States, the figures given for the slave States including the slaves:

YEAR	Free States	Slave States
1790	1,968,453	1,961,374
1800	2,684,616	2,621,316
1810	3,758,910	3,480,902
1820	5,152,372	4,485,819
1830	7,006,399	5,848,312
1840	9,733,922	7,334,433
1850	13,599,488	9,663,997
1860	19,128,418	12,315,372

The South lost no time in acting upon what many of her leaders had declared would be the signal of her withdrawal from the Union. President Buchanan's administration witnessed the culmination of the conflict that had for years been waged between the Free States and the Slave States. It was during this administration that the leaders of the South appear to have definitely decided that the welfare of their section could not be satisfactorily conserved while the Southern States remained a part of the Federal Union. Ever since the foundation of the Government, the statesmen of the South had for the most part maintained that theory of the Federal Constitution which regarded the ultimate sovereignty as residing not in the nation as a whole, but rather in the individual States themselves, which this theory—the theory of Calhoun and Hayne—held to be supreme and independent commonwealths. According to the view prevalent at the South, these sovereign States had entered into a league of union with the other States for purposes of mutual advantage; and this partnership, like others, was to endure only as long as its original purpose was maintained with regard to all the members. Events seemed now to indicate that the time for the dissolution of the compact had arrived. In the first place, the balance of political power was passing rapidly into the hands of a party inimical to the interests of the South, a party pledged to the ultimate abolition of slavery and to a commercial system of protection which was peculiarly unfavorable to an agricultural community such as the South then was. The greatest statesmen of the South had often deplored the presence of the slaves as an economic and social evil; yet, inasmuch as slavery actually existed, the question appeared to them a practical one rather than a matter of speculative interest. The Abolitionists of the North had begun a crusade which, conducted with extreme bitterness and violence of denunciation, exasperated the South beyond measure. Men who believed thoroughly in the abstract wrongfulness of slavery indignantly took up its defense. The continual threats of the Southerners to destroy the Union, the violence to which so many of them were so ready to resort, as in the case of the assault upon Senator Sumner, and the high-handed proceedings that had marked the civil war in Kansas, all served to embitter and intensify the opposition at the North.

As soon as the result of the Presidential election was known, the Legislature of South Carolina ordered a State convention, which on December 20th unanimously declared that "the Union now subsisting between South Carolina and other States, under the name of the United States, is hereby dissolved." The example of South Carolina was followed by Mississippi, January 9, 1861; Florida, January 10; Alabama, January 11; Georgia, January 19; and later by Louisiana, Texas, Virginia, Arkansas, North Carolina, and Tennessee. Kentucky and Missouri were divided.

On February 4, 1861, delegates from seven seceding States met at Montgomery, Ala., and formed a provisional government, under the title of the Confederate States of America (q.v.). A provisional constitution was adopted similar in most respects to that of the United States, and the Government formally inaugurated, February 18, 1861, with Jefferson Davis, of Mississippi, as President, and Alexander H. Stephens, of Georgia, as Vice-President, and on May 24th, the seat of government was established at Richmond, Va. On the same day on which the Confederate delegates met at Montgomery a Peace Congress, in which twenty-one States were represented, assembled at Washington, but accomplished nothing. (See Peace Congress.) As State after State withdrew from the Union, its Senators and Representatives in Congress resigned their seats; and a large proportion of the officers of the army and navy of Southern birth, believing that their first and final allegiance was due to their State, and that the action of each State carried with it all its citizens, also resigned their commissions.

President Buchanan, denying his constitutional power to compel the seceding States to return to the Union, though he believed that secession was unconstitutional, made a feeble and ineffectual attempt to relieve the garrison at Fort Sumter, in Charleston Harbor, closely besieged by the forces of South Carolina. Commissioners were sent by South Carolina to Washington to arrange for a transfer to the State of United States property lying therein, and for a division of the national debt, but were not officially received. During all this time great efforts were made, but without result, to effect compromises of the difficulties. See CRITTENDEN COMPROMISE; PEACE CONGRESS.

Meanwhile, to the vacillation and incompetence of the President the prompt and vigorous action of the Southern leaders formed a striking contrast. By their direction, armed forces were rapidly organized, United States arsenals and arms were seized, and batteries were planted for the reduction of such forts as threatened a firm resistance. In the last months, however, Buchanan's reorganized Cabinet showed a much more determined front.

Among the events of Buchanan's administration were the 'Mormon Rebellion' of 1857-58 (see MORMONS; MOUNTAIN MEADOWS MASSACRE), the disastrous financial panic of 1857, the discovery of silver and petroleum in the United States, the Congressional investigation of President Buchanan's connection with the Lecompton Bill (see COVODE INVESTIGATION), and the famous debates between Lincoln and Douglas. See LINCOLN, ABRAHAM.

XIX. and XX. ADMINISTRATION OF ABRAHAM LINCOLN (1861-65) AND OF ANDREW JOHNSON (1865-69). *Cabinet.—Secretary of State,* William H. Seward, New York, March 5, 1861. *Secretary of the Treasury,* S. P. Chase, Ohio, March 5, 1861; W. P. Fessenden, Maine, July 1, 1864; Hugh McCulloch, Indiana, March 7, 1865. *Secretary of War,* Simon Cameron, Pennsylvania, March 5, 1861; Edwin M. Stanton, Pennsylvania, January 15, 1862; U. S. Grant (*ad interim*), August 12, 1867; Edwin M. Stanton (reinstated), January 14, 1868; J. M. Schofield, New York, May 28, 1868. *Secretary of the Navy,* Gideon Welles, Connecticut, March 5, 1861. *Secretary of the Interior,* Caleb P. Smith, March 5, 1861; John P. Usher, Indiana, January 8, 1863; James Harlan, Iowa, May 15, 1865; O. H. Browning, Illinois, July 27, 1866. *Attorney-General,* Edward Bates, Missouri, March 5, 1861; Titian J. Coffee, June 22, 1863; James Speed, Kentucky, December 2, 1864; Henry Stanbery, Ohio, July 23, 1866; William M. Evarts, New York, July 15, 1868. *Postmaster-General,* Montgomery Blair, Maryland, March 5, 1861; William Dennison, Ohio, September 24, 1864; Alexander W. Randall, Wisconsin, July 25, 1866.

On March 4, 1861, President Lincoln was inaugurated at Washington. In his inaugural address, he said: "I have no purpose, directly or indirectly, to interfere with the institution of slavery in the States where it exists. I believe that I have no lawful right to do so, and I have no inclination to do so." He also said, however: "The Union of these States is perpetual," and "No State upon its own mere motion can lawfully get out of the Union." The tension at the time was extreme, and was not lessened by the vigorous efforts at conciliation which marked the first month of his administration; and the feelings of the whole Northern people were inflamed by the bombardment April 12th-13th and the enforced surrender on April 14th of Fort Sumter, in Charleston Harbor. (See FORT SUMTER.) On April 15th President Lincoln called for 75,000 three months' volunteers, large numbers of whom were in a few days marching to the defense of Washington. After the battle of Bull Run on July 21st (see BULL RUN, FIRST BATTLE OF), Congress voted to call out 500,000 men.

On January 1, 1862, the United States had about 576,000 men in the field, and the Confederates had about 350,000. For an account of the military operations, see CIVIL WAR and separate articles on the various battles; and for an account of the Confederacy, see CONFEDERATE STATES OF AMERICA.

On July 1, 1862, the President called for 300,000 three years' men, and on August 4th for 300,000 nine months' militia for the Federal Army. The United States Congress passed an act on August 6, 1861, freeing all slaves used by Confederates in military operations in the Confederacy; in April, 1862, purchased and emancipated all slaves in the District of Columbia; and on June 9, 1862, abolished slavery throughout the public domain. On January 1, 1863, President Lincoln issued a proclamation in pursuance of a prior proclamation issued on September 22, 1862, after the battle of Antietam (q.v.), declaring the freedom of all the slaves in the rebellious States. (See EMANCIPATION PROCLAMATION.) The suspension of the writ of habeas corpus (q.v.), the frequent seizure of newspapers, the dispersion of public meetings, and the imprisonment without trial of opponents of the Government of the North, were generally recognized as essential to the security of the nation, although the introduction of such practices gave rise to sharp criticism of the Administration and furnished the opponents of its policy with ample opportunity for partisan attacks. (See VALLANDIGHAM, C. L.; and MILLIGAN, *ex parte.*) The unanimity of the North was also somewhat affected by great peace-meetings, while the disturbed state of the public feeling was increased by the terrible draft riots in New York, in July, 1863. (See DRAFT RIOTS IN NEW YORK.) Business conditions became unstable, as many banks had been forced to suspend specie payments, the paper money of the United States having largely depreciated. Nevertheless, the strength of the Government was not seriously impaired, the appropriations of Congress in 1863 amounting to $972.-000.000. The Confederates were cut off from all foreign aid, except such as could come to them through the blockade, and their own resources, both of men and material, gradually became exhausted. The Southern railways had been in large measure destroyed or seized by the Federal troops, and it became difficult to transport supplies and to feed armies, while the North had the additional advantage of command of the sea and access to foreign markets.

In January, 1864, the United States had nearly 975,000 men raised and provided for; the entire Confederate forces probably numbered about 470,000. On April 9, 1865, the main Confederate army, under General Lee, surrendered to General Grant at Appomattox Court-House. On April 26th General Johnston surrendered to General Sherman in North Carolina; and with the surrender of Kirby Smith in Texas, on May 26th, the war was over.

In 1864 Lincoln had been reëlected President and Andrew Johnson, of Tennessee, elected Vice-President. The Democratic party had nominated General George B. McClellan, of New Jersey, and George H. Pendleton, of Ohio, on a platform which declared the conduct of the war a failure. Lincoln received 212 electoral votes, and McClellan 21, though the disparity between the popular votes was relatively much less, Lincoln receiving (counting the votes cast by soldiers in the field) 2,330,552 and McClellan 1,835,985. Only New Jersey, Delaware, and Kentucky were carried by the Democrats. West Virginia had been admitted to the Union, June 19, 1863. See WEST VIRGINIA.

On April 14, 1865, while the North was rejoicing over the capture of Richmond and the surrender of General Lee, President Lincoln was assassinated at Ford's Theatre in Washington, by John Wilkes Booth (q.v.), while an accomplice attacked and severely injured Seward, the Secretary of State. Andrew Johnson thus became President.

The Thirteenth Amendment to the Constitution, forever abolishing slavery in the States and Territories of the Union, was declared ratified by two-thirds of the States, December 18, 1865.

The termination of the war imposed upon Congress and the Executive the duty of reconstructing the governments of the States that had seceded. This now became the most important question before the National Government, and for a decade dominated national politics. During Johnson's administration it involved a bitter struggle between the President and Congress, which culminated in the resolution of the House of Representatives, February 24, 1868, to impeach him "of high crimes and misdemeanors." (See JOHNSON, ANDREW; RECONSTRUCTION.) The immediate occasion of the passage of this resolution was the course of President Johnson in violating the "Tenure of Office Act" (q.v.), which made requisite the consent of the Senate to removals from office by the President, and of which Congress availed itself to prevent the removal of Stanton from the position of Secretary of War. The Senate acted as the court of impeachment, and on March 23, 1868, the Chief Justice presiding, proceeded to try Andrew Johnson on eleven articles of impeachment. The result was his acquittal, the prosecution lacking the necessary two-thirds majority. It was not until 1868 that the States of Arkansas, Alabama, Florida, North and South Carolina, Georgia, and Louisiana were readmitted into the Union. On March 1, 1867, Nebraska had been admitted as a new State. About the same time Alaska was sold to the United States by Russia.

At the election of 1868 the Republican candidates were Ulysses S. Grant, of Illinois, and Schuyler Colfax, of Indiana. The Democrats nominated Horatio Seymour, of New York, and Francis P. Blair, Jr., of Missouri. Grant and Colfax received 214 electoral votes, and Seymour and Blair 80, the Democrats having carried eight States. On February 26, 1869, the Fifteenth Amendment to the Constitution, guaranteeing the right of suffrage without regard to race, color, or previous condition of servitude, passed Congress and was ratified March 30, 1870.

XXI. and XXII. ADMINISTRATION OF ULYSSES S. GRANT (1869-1877). *Cabinet.—Secretary of State*, E. B. Washburne, Illinois, March 5, 1869; Hamilton Fish, New York, March 11, 1869. *Secretary of the Treasury*, George S. Boutwell, Massachusetts, March 11, 1869; William A. Richardson, Massachusetts, March 17, 1873; Benjamin H. Bristow, Kentucky, June 2, 1874; Lot M. Morrill, Maine, June 21, 1876. *Secretary of War*, John A. Rawlins, Illinois, March 11, 1869; William T. Sherman, Ohio, September 9, 1869; William W. Belknap, Iowa, October 25, 1869; Alphonso Taft, Ohio, March 8, 1876; J. D. Cameron, Pennsylvania, May 22, 1876. *Secretary of the Navy*, Adolph E. Borie, Pennsylvania, March 5, 1869; George M. Robeson, New Jersey, June 25, 1869. *Secretary of the Interior*, Jacob D. Cox, Ohio, March 5, 1869; Columbus Delano, Ohio, November 1, 1870; Zachariah Chandler, Michigan, October 19, 1875. *Attorney-General*, E. R. Hoar, Massachusetts, March 5, 1869; Amos T. Akerman, Georgia, June 23, 1870; George H. Williams, Oregon, December 14, 1871; Edwards Pierrepont, New York, April 26, 1875; Alphonso Taft, Ohio, May 22, 1876. *Postmaster-General*, J. A. J. Creswell, Maryland, March 5, 1869; Marshall Jewell, Connecticut, August 24, 1874; James M. Tyner, Indiana, July 12, 1876.

One of the most important events of President Grant's administration was the meeting of the Joint High Commission, appointed to consider the *Alabama* case (see ALABAMA CLAIMS), and which concluded the Treaty of Washington (q.v.), ratified by the Senate May 24, 1871.

Among other notable occurrences during this administration was the completion in May, 1869, of the Union and Central Pacific railroads, begun in 1865, providing a continuous line of railway from the Missouri to the Pacific, and completing the transcontinental system. Out of the connection of the Government with the construction of these roads—the Government having given valuable subsidies in land and money to the constructing companies—arose the Crédit Mobilier scandal, which involved the reputation of many prominent officials and members of Congress. (See CRÉDIT MOBILIER OF AMERICA.) The enmity of the white population of the Southern States toward the freedmen, particularly in regard to the exercise by the latter of their newly acquired right of suffrage, attracted public attention, 1868-72, until Congress intervened by legislation in the form of the so-called Force Act of April, 1870. (See KU KLUX KLAN; RECONSTRUCTION.) Disputes arose in several of the States over contested elections, and the President intervened in Louisiana in 1872-73, by sending Federal troops to that State, to bring about an adjustment of the difficulty, the troops supporting the Republican candidate for Governor and installing him in office. (See LOUISIANA.) In this and other instances, as well as in the suppression of the Ku Klux Klan, the President was considered by many to have acted with undue severity toward the South. A movement was made by the Government at the desire of President Grant in the direction of the acquisition of San Domingo, the people of that country desiring annexation to the United States, but the project was defeated in the Senate. In March, 1871, the first steps were taken toward the reform of the civil service by a bill authorizing the President to appoint a board of Civil Service Commissioners to provide for the appointment of applicants for minor offices on the basis of an examination.

During General Grant's first administration a new party arose as the result of a reaction against the extreme centralization of power in the Federal Government due to the exigencies of war. This party was known as the Liberal Republican Party, and numbered among its adherents some of the most prominent names in the old Republican Party, such as Horace Greeley (q.v.), Charles Francis Adams, Charles Sumner, and Carl Schurz. This party nominated, in 1872, Horace Greeley, of New York, for President, and B. Gratz Brown, of Missouri, for Vice-President, on a platform deprecating any further interference by the Government in the local affairs of the South. (See LIBERAL REPUBLICAN PARTY; REPUBLICAN PARTY.) This ticket was ratified by the convention of the Democratic Party held in the same year. The Republicans renominated General Grant, with Henry Wilson (q.v.), of Massachusetts, for Vice-President. The Republican ticket received 286 electoral votes, against 66 scattering, Greeley having died before the Electoral College met. Of the popular votes Grant received 3,597,132, Greeley 2,834,125. In this election appeared for the first time the Prohibition Party and a Labor Reform Party, the latter being an expression of a significant movement among workingmen which began during this administration, and led in 1869 to the first attempt in the United States to organize on a permanent basis all kinds of manual labor. The votes of Louisiana and Arkansas and three votes from Georgia were not counted.

A serious difficulty with Spain arose because of the seizure on October 31, 1872, by the Spanish steamer *Tornado* of the *Virginius*, a filibustering vessel flying the American flag, and the execution of part of her crew. See VIRGINIUS MASSACRE.

In 1873-74 the party known as 'Grangers' or 'Patrons of Husbandry' (see GRANGE) rose into some prominence; an act for the resumption in 1879 of specie payment was passed in January, 1875; and an extensive 'Whisky Ring' involving a corrupt association among distillers and Federal officers to defraud the Government of the tax on liquors was exposed in the same year. (See WHISKY RING.) A new coinage act, since denounced by advocates of free silver as the 'crime of 1873,' was passed providing for the coinage of gold and of fractional silver currency; an act known as the 'salary grab' was passed in 1873; and much local disorder occurred in the Southern States between the so-called 'carpet-bag' governments and the white citizens, Grant interfering in what many considered a harsh and arbitrary manner. During Grant's second administration occurred the disastrous financial panic of 1873. A movement for the inflation of the paper currency was set on foot, and was checked by President Grant through his veto of the so-called Inflation Bill, which had been passed by Congress. This administration was disturbed by wars with the Modocs and Sioux, the latter of whom overwhelmed General Custer's command in 1876. (See CUSTER, GEORGE A.) In Philadelphia, between May and November, 1876, was held a mammoth exposition to commemorate the centennial of American independence. See CENTENNIAL EXHIBITION.

With Grant's administration of affairs much dissatisfaction was felt throughout the country, owing to corruption on the part of high Government officials. Before the close of his first term there were many signs of reaction against Republican rule, and the organization of the Liberal Republican Party showed the disaffection of a considerable element in the Republican Party itself. By the close of his second term a well-defined and powerful opposition had arisen, based primarily on the President's apparent severity toward the South; on legislative scandals, such as the Crédit Mobilier affair and the 'salary grab' scandal in Congress; the Whisky Ring scandal and the impeachment for corruption in distributing patronage of Belknap, Secretary of War, who resigned rather than submit to a trial; and on alleged general administrative demoralization, caused in part at least by the President's appointment, upon the advice of political leaders, of a number of unfit officials. Further discontent was caused by the consequences of the disastrous panic of 1873, for which, as was inevitable, the Administration was held by many in a measure accountable. Many 'War Democrats,' moreover, who had lent their support to the Republican Party when the prosecution of the war was the all-absorbing issue, now began to return to their old party affiliations, and to emphasize issues different from those immediately involved in the Republican war policy.

Colorado was admitted as a State, August 1, 1876. In 1876 the Republican candidates were Rutherford B. Hayes, of Ohio, and William A. Wheeler, of New York; the Democratic candidates were Samuel J. Tilden, of New York, and Thomas A. Hendricks, of Indiana. On the face of the returns, Tilden and Hendricks seemed to have 184 electoral votes, to 172 for Hayes and Wheeler, with the votes of Florida, South Carolina, and Louisiana, and one vote of Oregon in doubt. Charges were made of fraudulent voting in several States; party feeling ran so high as to suggest the possibility of acts of violence to secure control of the Government; and all the attendant circumstances made the struggle one of the most momentous since the foundation of the Government. Hayes and Wheeler were finally declared elected by an Electoral Commission chosen from both Houses of Congress and from the Supreme Court of the United States, whose decision was accepted by all concerned as final and irrevocable. (See ELECTORAL COMMISSION.) As thus finally decided 185 electoral votes were given to Hayes and Wheeler and 184 votes to Tilden and Hendricks.

XXIII. ADMINISTRATION OF RUTHERFORD B. HAYES (1877-1881). *Cabinet.—Secretary of State,* William M. Evarts, New York, March 12, 1877. *Secretary of the Treasury,* John Sherman, Ohio, March 8, 1877. *Secretary of War,* George W. McCrary, Iowa, March 12, 1877; Alexander Ramsey, Minnesota, December 12, 1879. *Secretary of the Navy,* Richard W. Thompson, Indiana, March 12, 1877; Nathan Goff, Jr., West Virginia, January 6, 1881. *Secretary of the Interior,* Carl Schurz, Missouri, March 12, 1877. *Attorney-General*, Charles Devens, Massachusetts, March 12, 1877. *Postmaster-General*, David M. Key, Tennessee, March 12, 1877; Horace Maynard, Tennessee, August 25, 1880.

The early portion of this administration was made memorable by the troubles in South Carolina and Louisiana, where rival State governments, each claiming to be legally elected, contended for supremacy. In the former State the difficulty was settled by President Hayes, who ordered the withdrawal of the United States troops which had been stationed at Columbia, and had been an objectionable feature of the contest; whereupon the Republican Governor, Chamberlain, retired, and General Wade Hampton took peaceful possession of the office. A settlement was also effected in Louisiana, a commission being sent thither by the President, when the Democratic Governor, Nichols, was enabled to gain possession of his seat, the Federal troops being in this instance also withdrawn from New Orleans. This marked the end of Federal interference in the local concerns of the Southern States, an interference that had become yearly more objectionable to moderate men at the North, who no longer cherished the animosities resulting from the Civil War. See RECONSTRUCTION.

This year was further noteworthy by the occurrence, in July, of railroad strikes and riots throughout the country, to the injury of business and with serious loss of property. (See STRIKES AND LOCKOUTS.) The excitement occasioned by the near approach of the period fixed by Congress for the resumption of specie payments led to the formation of a party opposed to the prevailing sentiment with regard to financial questions. Such a party was organized in Toledo, Ohio, February 22, 1878, under the name of the National Party, delegates being present from 28 States; its principles included bimetallism, the suppression of national bank issues, a graduated income tax, and opposition to Chinese labor. In the State elections of the same year this party, which became popularly known as the Greenback Party (q.v.), polled upward of a million votes.

In February, 1878, the dissatisfaction which had been felt by the advocates of silver coinage with the act of 1873 suspending the coinage of silver, except for subsidiary coins, found expression in the passage by Congress, over the President's veto, of the so-called Bland-Allison Bill, which provided for the annual purchase by the Secretary of the Treasury of at least two million dollars' worth* of silver bullion to be coined into legal-tender dollars, each containing 412½ grains of standard silver. On January 1, 1879, specie payments were resumed throughout the United States, after a suspension of seventeen years, and in accordance with the act of Congress approved January 14, 1875, the process of resumption being effected without excitement.

An extraordinary movement northward of the colored population from certain of the Southern States took place in 1879 and was the source of much uneasiness among the planters. (See NEGRO EXODUS.) This year also saw the decline and fall of the labor agitation in San Francisco, which under the leadership of Denis Kearney (q.v.) had been continued with great virulence since 1877.

On June 2, 1880, the Republican National Convention met in Chicago to nominate candidates for President and Vice-President. The names most prominent before this convention were those of Ulysses S. Grant, James G. Blaine, and John Sherman. The final choice, however, was James A. Garfield, of Ohio, with Chester A. Arthur, of New York, for Vice-President. On June 11th the Greenback national convention met in Chicago and nominated for President James B. Weaver, who was afterward accepted as the candidate of the Socialist party. On June 22d the Democratic National Convention assembled at Cincinnati, Ohio, and nominated Winfield S. Hancock, of Pennsylvania, and William H. English, of Indiana. The result of the election was the choice of Garfield and Arthur, who received 214 electoral votes, against 155 votes cast for Hancock and English.

XXIV. ADMINISTRATION OF JAMES A. GARFIELD (1881) AND OF CHESTER A. ARTHUR (1881-1885). *Cabinet.—Secretary of State*, James G. Blaine, Maine, March 5, 1881; Frederick T. Frelinghuysen, New Jersey, December 12, 1881. *Secretary of the Treasury*, William H. Windom, Minnesota, March 5, 1881; Charles J. Folger, New York, October 27, 1881. *Secretary of War*, Robert T. Lincoln, Illinois, March 5, 1881. *Secretary of the Navy*, W. H. Hunt, Louisiana, March 5, 1881; William E. Chandler, New Hampshire, April 12, 1882. *Secretary of the Interior*, S. J. Kirkwood, Iowa, March 5, 1881; Henry M. Teller, Colorado, April 6, 1882. *Attorney-General*, Wayne MacVeagh, Pennsylvania, March 5, 1881; Benjamin H. Brewster, Pennsylvania, December 16, 1881. *Postmaster-General*, Thomas L. James, New York, March 5, 1881; Timothy O. Howe, Wisconsin, December 20, 1881; W. Q. Gresham, Indiana, April 3, 1883; Frank Hatton, Iowa, October 14, 1884.

The politicians in the Republican Party who had favored the election of General Grant for a third term of the Presidency, popularly known, particularly in New York, as 'Stalwarts,' had not been pleased with the nomination of Garfield, and in the Presidential campaign they had been induced to give his candidacy their support only on a general understanding that the candidate if successful would give them a liberal share of patronage. The new President had in various ways shown his desire to conciliate both wings of the party; he had held many conferences with the leaders of each, and his first nominations were apparently dictated by a desire to conciliate the 'Stalwarts.' But his appointment of William H. Robertson, who had been instrumental in securing the President's nomination at Chicago, to the post of Collector of the Port of New York, aroused the opposition of the Senator from that State, Roscoe Conkling (q.v.), a leading 'Stalwart.' Finding that his opposition was ineffectual, Conkling and his colleague, Thomas C. Platt (q.v.), resigned their seats in the Senate, May 16, 1881, and appealed to the New York Legislature for reëlection as a justification of their course. The appeal was unsuccessful and a bitter contest, lasting until the latter part of July, ended with the election of Miller and Lapham to the Senate. Meanwhile the President's appointments had been confirmed. The new Postmaster-General had discovered colossal frauds in the Star Route Service of the Postal Department, and an effort was made to bring the criminals to justice. (See STAR-ROUTE FRAUDS.) The diplomacy of Secretary Blaine in regard to the war between Chile and Peru and the Panama Canal (q.v.) excited considerable newspaper criticism.

---

* He could buy as much as four million dollars' worth if he so desired.

On July 2d President Garfield was shot by an assassin, a disappointed office-seeker, Charles J. Guiteau, and after lingering for seventy-nine days between life and death died, on September 19th, at Elberon, N. J. (See GARFIELD, JAMES A.) On the same day in New York, Vice-President Arthur took the oath of office as President.

Among the national events of 1882 were the passage by Congress of the Anti-Polygamy Bill, March 22d; the Apportionment Bill, increasing the number of Congressional Representatives to 325; and the Anti-Chinese Bill, suspending Chinese immigration for twenty years. The last was vetoed by the President, who, however, signed a subsequent bill limiting the term of suspension to ten years. Among the several State elections of this year, one at least had a national significance. In New York the lukewarmness of that wing of the Republican Party which had sympathized with General Garfield in his contest with the leaders of the faction to which Arthur was allied, and the indignation of the 'Independents' at the political methods pursued by President Arthur to secure the nomination and election of his friend, Charles J. Folger, as Governor of the State, resulted in the election of the Democratic candidate, Grover Cleveland (q.v.), by the immense majority of 192,000 votes. The victory of the Democrats in Pennsylvania was also looked upon as to some extent a rebuke of the Administration, and especially of machine methods in politics. The question of civil-service reform was now pressed with renewed eagerness by its advocates; and the so-called Pendleton Bill, which had already passed the Senate, passed the House in January, 1883, and was signed by the President. See CIVIL-SERVICE REFORM.

The Republican National Convention of 1884 met in Chicago during the first week of June and the fourth ballot resulted in the nomination of James G. Blaine (q.v.) for the Presidency, and of John A. Logan, of Illinois, for the Vice-Presidency. The nomination of Blaine was secured in spite of bitter organized opposition of the 'Independent' faction in the Republican Party, popularly known as 'Mugwumps' (q.v.). The papers which represented the views of the 'Independents' withheld their support from Blaine, and indicated that they would cast their influence on the side of the Democratic candidate, in case some statesman of tried incorruptibility were chosen by the Democratic convention. It was generally understood that either Grover Cleveland or Thomas F. Bayard would be acceptable to them. When the convention met in July these two were the leading candidates on the first ballot. On the second ballot Cleveland secured the necessary two-thirds majority, and was declared the nominee. Thomas A. Hendricks, of Indiana, was nominated for Vice-President. Tickets were put in the field by the Prohibitionists (see PROHIBITION), who nominated John P. St. John, of Kansas, for President, and William Daniel, of Maryland, for Vice-President; and by the Anti-Monopoly and Greenback Labor parties, both of which nominated Gen. Benjamin F. Butler (q.v.), of Massachusetts, for President. The campaign which followed developed unusual excitement, party rancor, and personal recrimination. The election was unexpectedly close, and the result for a few days hung in doubt over conflicting returns in the pivotal State of New York; but the official count gave a plurality of 1047 to Cleveland, who received 219 electoral votes, while Blaine received 182, and a popular vote of 4,874,986, while Blaine received 4,851,981. St. John had a popular vote of 150,369, and Butler a popular vote of 175,370.

XXV. ADMINISTRATION OF GROVER CLEVELAND (1885-89). *Cabinet.—Secretary of State,* Thomas F. Bayard, Delaware, March 6, 1885. *Secretary of the Treasury,* Daniel Manning, New York, March 6, 1885; Charles S. Fairchild, New York, April 1, 1887. *Secretary of War,* William C. Endicott, Massachusetts, March 6, 1885. *Secretary of the Navy,* William C. Whitney, New York, March 6, 1885. *Secretary of the Interior,* Lucius Q. C. Lamar, Mississippi, March 6, 1885; William F. Vilas, Wisconsin, January 16, 1888. *Attorney-General,* Augustus H. Garland, Arkansas, March 6, 1885. *Postmaster-General,* William F. Vilas, Wisconsin, March 6, 1885; Don M. Dickinson, Michigan, January 16, 1888.

Cleveland was the first Democratic President to be chosen after the election of 1856. His administration from the outset was marked by a general application to the public service of the principles so long advocated by the friends of civil-service reform, the President applying the principles of the Pendleton Bill (see CIVIL-SERVICE REFORM) to many offices not specifically covered by the act. For the first time in half a century no sweeping changes were made in the public service on the accession to power of a new party.

In 1886 a bill passed Congress to regulate the succession to the Presidential office—a question that assumed some special importance on the death of Vice-President Hendricks. Among the important Congressional acts of this Administration were the new Anti-Polygamy or the Edmunds-Tucker Act (1887) dissolving the Mormon Church as a corporate body, and confiscating all the property of that Church in excess of $50,000; the Interstate Commerce Act (q.v.) of 1887; and an act (1888) absolutely prohibiting further immigration of the Chinese. With respect to legislation President Cleveland's administration was characterized by an unprecedented number of Presidential vetoes, the number aggregating more than 300, mostly of pension bills.

In December, 1887, President Cleveland sent to Congress a message devoted to the single question of the tariff. After stating that the estimated surplus in the Treasury in June, 1888, would be fully $140,000,000, he declared the existing tariff laws to be the source of unnecessary taxation, and asked for a reduction of the duties on raw materials, especially on wool. In accordance with this recommendation, the so-called Mills Bill was introduced and passed the House. It removed duties aggregating $50,000,000 per annum, but failed to pass the Senate, which was Republican. At this session of Congress the largest appropriation for rivers and harbors ever known was made. It amounted to $22,227,000, and became law without the President's signature.

At the Democratic Convention of 1888, Cleveland was nominated for President, with Allen G. Thurman, of Ohio, as the candidate for Vice-President. The Republicans nominated Benjamin Harrison, of Indiana, and Levi P. Morton, of New York. The Prohibition Party put forward as its candidates Clinton B. Fisk, of New Jersey, and John A. Brooks, of Missouri. The campaign was fought out largely on the tariff questions raised by Cleveland's message of 1887, and resulted in the choice of the Republican candidates, who received 233 electoral votes, as against 168 cast for the Democratic nominees, the popular vote for Cleveland, however (5,540,329), exceeding that of Harrison (5,439,853). The Prohibition ticket received 249,406 votes, and the Union Labor candidate, Alson J. Streeter, 146,935 votes.

XXVI. Administration of Benjamin Harrison (1889-93). *Cabinet.—Secretary of State,* James G. Blaine, Maine, March 7, 1889. *Secretary of the Treasury,* William Windom, Minnesota, March 7, 1889; Charles Foster, Ohio, February 21, 1891. *Secretary of War,* Redfield Proctor, Vermont, March 7, 1889. *Attorney-General,* W. H. H. Miller, Indiana, March 7, 1889. *Postmaster-General,* John Wanamaker, Pennsylvania, March 7, 1889. *Secretary of the Navy,* Benjamin F. Tracy, New York, March 7, 1889. *Secretary of the Interior,* John W. Noble, Missouri, March 7, 1889. *Secretary of Agriculture,* Jeremiah M. Rusk, Wisconsin, March 7, 1889.

The administration of Harrison witnessed a remarkable growth of public interest in the foreign relations of the United States, both commercially and otherwise. One cause of this is to be found in the meeting of the so-called Pan-American Congress at Washington, October 21, 1889, under the presidency of Secretary Blaine, which did much to foster a popular sentiment in favor of commercial reciprocity between the United States and the other American republics. This policy, warmly advocated by Blaine, found expression in the so-called 'reciprocity section' of the important bill for the revision of the tariff prepared by William McKinley (q.v.), of Ohio, which passed both Houses of Congress and became a law October 1, 1890. (For other provisions of the bill, see Tariff.) Under this section reciprocity treaties were early negotiated with Brazil and Spain, and the principle was thereafter strikingly developed.

Several diplomatic difficulties of more or less seriousness had arisen between the United States and foreign Powers within a few years. Among these had been complications growing out of a state of anarchy on the Isthmus of Panama, the United States Government, in accordance with its treaty obligations, being required to send an armed force to protect the Isthmus. A dispute with Germany over the Samoan Islands (q.v.) in 1889 had also taken a serious aspect, though finally arranged in an amicable manner by a treaty signed at Berlin (February 4, 1890). A serious disagreement with England also arose in 1890-91 regarding the rights of this country acquired in Bering Sea by our treaty with Russia, and was referred to arbitration in 1891. The question was finally settled in 1893. (See Bering Sea Controversy.) The lynching of several Italians by a mob in New Orleans, in 1891, led to something like a diplomatic rupture with Italy, which recalled its Minister from Washington. In October, 1891, difficulties arose with Chile in consequence of a murderous assault upon American seamen in Valparaiso.

In November, 1889, four States, North Dakota, South Dakota, Montana, and Washington, were admitted into the Union. On May 2, 1890, the new Territory of Oklahoma (q.v.) was organized, and Idaho (July 3d) and Wyoming (July 11th) were admitted as States. Other events of importance during Harrison's administration were the passage in 1890 of the Dependent Pension Bill, which nearly doubled the number of pensioners; the repeal of the Bland-Allison Silver Coinage Act; the passage of the Sherman Silver Purchase and Coinage Act, requiring the Secretary of the Treasury to purchase 4,500,000 ounces of silver each month and to coin 2,000,000 ounces into silver dollars each month until July 1, 1891; and the labor disturbances at Homestead, Pa.

The close of Harrison's administration witnessed a serious financial panic. An event of international importance was the overthrow of the monarchy in Hawaii by the foreign residents, and the application made by the new Government for annexation of the islands to the United States. The President sent a treaty of annexation to the Senate (February, 1893), but it was not acted upon. See Hawaiian Islands.

The conventions of the two great political parties had been held in June, 1892. The Democrats nominated Grover Cleveland, of New York, for the Presidency, and Adlai E. Stevenson, of Illinois, for the Vice-Presidency. The Republican Convention renominated President Harrison for the Presidency and selected Whitelaw Reid, of New York, for the Vice-Presidency. The People's Party, or Populists, nominated Generals J. B. Weaver, of Iowa, and James G. Field, of Virginia. The ensuing campaign was largely conducted on the question of the tariff, and resulted in the election of Cleveland and Stevenson, who received 277 electoral votes, as against 145 for Harrison and Reid, and 22 for Weaver and Field.

XXVII. Second Administration of Grover Cleveland (1893-97). *Cabinet.—Secretary of State,* Walter Q. Gresham, Indiana, March 6, 1893; Richard Olney, Massachusetts, June 10, 1895. *Secretary of the Treasury,* John G. Carlisle, Kentucky, March 6, 1893. *Secretary of War,* Daniel S. Lamont, New York, March 6, 1893. *Secretary of the Navy,* Hilary A. Herbert, Alabama, March 6, 1893. *Secretary of the Interior,* Hoke Smith, Georgia, March 6, 1893. *Attorney-General,* Richard Olney, Massachusetts, March 6, 1893; Judson Harmon, Ohio, June 8, 1895. *Postmaster-General,* Wilson S. Bissell, New York, March 6, 1893; William L. Wilson, West Virginia, March, 1895. *Secretary of Agriculture,* J. Sterling Morton, Nebraska, March 6, 1893.

In his second administration the President applied himself particularly to the promotion of tariff and financial reforms, and this period was marked by the intense and persistent opposition of his own party in both Houses of Congress. His earliest act of importance was the withdrawal from the Senate of the treaty for the annexation of Hawaii to the United States, which had been negotiated in the closing days of the previous administration. He also sent James H. Blount, ex-Congressman from Georgia, to Hawaii as a special commissioner to investigate the circumstances of the overthrow of the royal Government, and, on his report, took the ground that the United States Government had through its representatives committed a grievous wrong against the kingdom. See Hawaiian Islands.

The legislation on the tariff was the most important domestic incident of this term. A new bill, bearing the name of Chairman Wilson, of the House Committee on Ways and Means, and providing for free raw sugar, free wool, free coal, free lumber, and free iron ore, and reducing the duties on many articles in the existing schedules, was introduced December 19, 1893. In the following month a measure providing for an income tax was presented in the House, and that and others concerning the internal revenue were incorporated in the bill during the subsequent debate. When the bill reached the Senate it underwent radical alterations, many amendments being made, notably those imposing a duty on sugar, coal, and iron ore, and the House at first refused to concur in the Senate amendments. Finally, however, it withdrew from its position of non-concurrence and the bill was passed. (See Tariff.) The President allowed the bill to become a law without his signature. On an appeal to the United States Supreme Court, that body, April 2, 1893, declared two provisions of the income-tax law unconstitutional, and upheld the remainder by a tie vote, and on May 20th, on a rehearing, declared the whole measure unconstitutional.

Early in the term occurred the great commercial panic of 1893, which was followed by a long period of depression. President Cleveland was determined to maintain the gold standard, and in the summer of that year called an extra session of Congress in order to secure the repeal of the Sherman Act of 1890. This he accomplished in the face of great opposition. In January, 1894, because of the heavy withdrawal of gold coin from the Treasury and the large reduction in the gold reserve of $100,000,000, Secretary Carlisle, of the Treasury Department, invited proposals for the purchase of $50,000,000 of 5 per cent. bonds, and this sale resulted in the acquisition of $58,660,917 in gold, which was added to the reserve. The drain on the reserve, however, continued, and in November following the Secretary issued a second call for the purchase of $50,000,000 bonds, when the subscriptions aggregated $178,341,150 and the sale yielded $58,538,500 in gold, which brought the reserve to $111,142,021. In about two months after this sale the reserve declined to $41,340,181. The President, in a special message to Congress, January 28, 1895, recommended that authority be given the Secretary of the Treasury to issue bonds bearing a low rate of interest, to maintain the reserve and redeem outstanding notes issued for the purchase of silver; but Congress did not approve the recommendation. Secretary Carlisle then signed a contract with New York bankers to supply the Government with 3,500,000 ounces of standard gold coin, at the rate of $17.80441 per ounce, for 30-year 4 per cent. bonds, on condition that one-half of the coin should be obtained in Europe, and that if Congress should authorize their issue, bonds payable in gold and bearing 3 per cent. interest might within ten days be substituted at par for the 4 per cent. bonds. The President again urged Congress to authorize the issue of low-rate bonds, declaring in his message that more than $16,000,000 in interest would be saved thereby, and Congress again withheld its sanction. Under the contract the Secretary sold $62,315,000 in bonds for a little over $65,000,000 in gold. The subscriptions to this loan aggregated $590,000,000 in London and $200,000,000 in New York. Under the continuance of the business depression, Secretary Carlisle was forced early in 1896 to sell $100,000,000 of 30-year 4 per cent. bonds.

The silver question came up again in Congress, February 7, 1894, when the House Committee on Coinage, Weights, and Measures reported a bill directing the coinage of the silver held in the Treasury. A substitute by Congressman Bland providing for the coinage of the seigniorage was adopted, and passed in the House by a vote of 168 yeas to 129 nays, with 56 not voting, and in the Senate by 44 yeas to 31 nays, 10 not voting. This bill was vetoed by the President, and it failed of passage over the veto. In December, 1895, the House passed a bond bill prepared by the Republican members of its Committee on Ways and Means, and when it reached the Senate the Finance Committee reported a free silver coinage substitute, which the Senate passed, February 1, 1896, by a vote of 42 yeas to 35 nays. The House refused to concur in the substitute, and rejected it by a vote of 215 yeas to 90 nays. A few days afterwards the Senate defeated the Emergency Revenue Bill, prepared by Republican members of the House Committee on Ways and Means, and passed by the House by a vote of 205 yeas to 61 nays, the Senate vote being 22 yeas to 33 nays.

A long-standing dispute between Venezuela and Great Britain, over the boundary line between Venezuela and British Guiana, was the cause of a Presidential message to Congress in December, 1895, recommending the appointment of a commission to determine this boundary line. This message, on account of its sharp and determined tone toward Great Britain, created a great sensation. Both Houses unanimously concurred in the recommendation, and a commission was appointed January 1, 1896. (See Venezuela.) Among other events of President Cleveland's second administration were the World's Columbian Exposition at Chicago, the settlement of the Bering Sea controversy (q.v.) in 1893, the signing of treaties with China and Japan, in 1894, the extension by the President of civil-service reform (q.v.), the calling out of Federal troops to protect Government property and the mails against strikers at Chicago in 1894, the admission of Utah into the Union, in 1896, and the arbitration by the President of disputes between Brazil and the Argentine Republic, Colombia and Italy, and Brazil and Italy.

The Presidential campaign of 1896 turned principally on the Democratic demand for the free coinage of silver at the ratio of 16 to 1. There were seven tickets in the field, viz. the Republican (sound money), William McKinley, of Ohio, and Garret A. Hobart, of New Jersey; the Democratic (free silver), William J. Bryan, of Nebraska, and Arthur Sewall, of Maine; the National Democratic (sound money), John M. Palmer, of Illinois, and Simon B. Buckner, of Kentucky; the Prohibition, Joshua Levering and Hale Johnson; the Socialist Labor, Charles H. Matchett and Matthew Maguire; the Populist, William J. Bryan and Thomas E. Watson; and the Free Silver Prohibition, Charles E. Bentley and James H. Southgate. The total popular vote was 13,930,942, and the electoral, 447, of which the Republican candidates received 7,104,779 and 271, respectively, and the Democratic, 6,502,925 and 176. The Populist ticket received 144,928 votes; National Democratic, 134,731; Prohibition, 123,428; Socialist Labor, 35,306; and Free Silver Prohibition, 13,535.

XXVIII. ADMINISTRATIONS OF WILLIAM McKINLEY (March 4, 1897-September 14, 1901) AND THEODORE ROOSEVELT (September 14, 1901). *Cabinet.—Secretary of State*, John Sherman, Ohio, 1897; W. R. Day, Ohio, 1897; John Hay, Ohio, 1898. *Secretary of the Treasury*, Lyman J. Gage, Illinois, 1897; Leslie M. Shaw, Iowa, 1901. *Secretary of the Navy*, John D. Long, Massachusetts, 1897; William H. Moody, Massachusetts, 1902. *Secretary of War*, Russell A. Alger, Michigan, 1897; Elihu Root, New York, 1899; W. H. Taft, Ohio, 1904. *Secretary of the Interior*, Cornelius N. Bliss, New York, 1897; E. A. Hitchcock, Missouri, 1899. *Postmaster-General*, James A. Gary, Maryland, 1897; Charles Emory Smith, Pennsylvania, 1898; Henry C. Payne, Wisconsin, 1901. *Attorney-General*, Joseph McKenna, California, 1897; J. W. Griggs, New Jersey, 1897; Philander C. Knox, Pennsylvania, 1901. *Secretary of Agriculture*, James Wilson, Iowa, 1897. *Secretary of Labor and Commerce*, George B. Cortelyou, 1903.

In his inaugural address President McKinley favored the protection of American industries, the restriction of immigration, the promotion of civil-service reform, the establishment of international bimetallism, and the appointment of a commission on currency and finance.

The Administration was concerned chiefly, however, with the war against Spain, growing out of the intolerable condition of affairs in Cuba, and with the problems growing out of the war and the acquisition by the United States of the Philippines and Porto Rico. These subjects will be found treated under the titles SPANISH-AMERICAN WAR; CUBA; PHILIPPINES; and PORTO RICO.

After the abolition of Spanish sovereignty over Cuba, military government under General Brooke was established by the United States. The Cuban Army was disbanded after an appropriation by Congress for the payment of soldiers. When the volunteers were withdrawn and regular troops substituted, order was fairly well maintained. On December 13, 1899, General Brooke was succeeded by General Wood. Public schools were established, an insular treasury organized, municipal autonomy increased, and other administrative measures introduced. On November 15, 1900, a convention assembled, and a Constitution, framed on the model of that of the United States, was completed on February 21, 1901. The question of the relation of Cuba to the United States complicated the settlement of the question of the Constitution. The United States proposed: (1) that no foreign Power should be permitted to secure control in the island; (2) that the United States should have a coaling station there; (3) that the debt-contracting power of the Cuban Government should be limited; and (4) that, when necessary, the United States should interfere with an armed force to maintain the Government and Cuban independence. The proposals met considerable opposition in Cuba, but were finally accepted. On December 31, 1901, a President, Senate, and House were elected, and an executive order from Washington, March 25, 1902, provided for the evacuation of Cuba and the transference of the government to the new authorities on May 20, 1902.

Under the authority of a joint resolution of Congress, Hawaii was annexed to the United States in August, 1898. Five commissioners were appointed to investigate conditions there and recommend legislation. On June 14, 1900, under an act of Congress approved April 30th of that year, the islands were organized into a Territory of the United States. See HAWAIIAN ISLANDS.

Owing to the disturbances in Samoa following the death of Malietoa, in 1899, the existing joint protectorate was abandoned, and Tutuila (q.v.) and other minor islands passed under the sovereignty of the United States, which took formal possession April 17, 1900.

On January 24, 1902, Denmark ceded to the United States the Danish West Indies for $5,000,000. The treaty was, however, finally rejected by the Upper House of the Danish Legislature, notwithstanding the extension of the time of ratification to July 24, 1903.

McKinley's administration was marked by the growth throughout the country of a strong anti-trust movement, which resulted in a large number of State laws regulating the formation and operation of large combinations of capital. In its decision in the case of United States vs. Trans-Missouri Freight Association, the Supreme Court gave an interpretation of the Sherman Anti-Trust Law, which forced the dissolution of a great association and gave a considerable impetus to the anti-trust movement. In political platforms, conferences, and party press a vigorous agitation was carried on against combinations. An Industrial Commission was created on June 18, 1898, for the purpose of investigating questions pertaining to immigration, labor, agriculture, manufacture, and business. The organization of trusts continued with increasing rapidity. During the first four months of 1899 the capitalization of these trusts was $2,000,000,000, as against $1,000,000,000 in the preceding twelve months. On February 12, 1900, an Anti-Trust League was formed at a convention in Chicago. (See TRUSTS.) The administration of McKinley coincided with an unprecedented commercial development.

While the great problems connected with the regulation of trusts and settlement of the dependencies were under consideration, the campaign of 1900 was inaugurated. At the Republican National Convention held on June 19th, at Philadelphia, President McKinley and Theodore Roosevelt were nominated by acclamation and the principles of 1896 reaffirmed. On July 4th the Democratic Convention at Kansas City nominated William J. Bryan and Adlai E. Stevenson, and declared against imperialism and militarism.

The platform advocated Cuban independence, the preparation of the Philippines for independence, and the renunciation of American dominion over those islands. The free-silver plank was also inserted. The Democratic nominees received the indorsement of the Anti-Imperialist League, the Populist Fusionists, and the Silver Republicans. The election resulted in a complete victory for the Republicans, McKinley receiving 292 electoral votes and Bryan 155. The popular vote was as follows: Republican, 7,206,677; Democratic, 6,374,397; Prohibitionist, 208,555; Social-Democratic, 84,003; Socialist Labor, 39,537; Union Reform, 5698; Middle of the Road Populist, 50,373; United Christian, 1060.

While receiving the people in the Temple of Music at the Pan-American Exposition at Buffalo, President McKinley was shot down by an anarchist, named Czolgosz (q.v.), on September 6, 1901. After eight days of suffering, the President died at Buffalo, and on September 19th was buried at his old home in Canton.

On the day of McKinley's death Vice-President Roosevelt took the oath of office. He retained the Cabinet of his predecessor and announced his intention to continue unaltered the policy of the previous Administration.

Important measures of the two administrations which have not been mentioned above may be briefly summarized. In 1900 a currency law was passed by Congress, which defined the gold dollar as the standard of value in the United States. In the same year a civil code for Alaska was enacted and provision made for the representation of the Territory in Congress. In 1901 the army was reorganized and the 'canteen' (q.v.) abolished. The Fifty-seventh Congress passed the Chinese Exclusion Bill, and an act for reclaiming and irrigating arid lands of the West. By a law approved March 6, 1902, the Census Office was made a permanent bureau with increased duties and facilities. In December, 1902, a reciprocity treaty was concluded with Cuba providing for mutual concessions in the customs duties. The Senate, however, ratified it only upon condition that it should not go into effect until approved by Congress. In 1903 a new Department of Labor and Commerce was created, the Secretary being made a regular member of the Cabinet. A Bureau of Manufactures and Corporations was established, with important functions of investigation and regulation, which have not as yet been tested. Laws for the reorganization of the militia and increase of the navy were passed. A general staff for the army was created. The anti-trust movement culminated in the Elkins Anti-Trust Act (1903), which requires common carriers to file tariff rates and forbids rebates, and which includes provisions and appropriations for the purpose of facilitating the prosecution of offenders.

After long and vexatious negotiations, a final convention on the Isthmian question was ratified by Great Britain and the United States on December 16, 1901. The United States was given the right to construct and police the canal; Great Britain withdrew her claim to participation in the maintenance of neutrality upon the condition that free navigation on the basis of the Suez stipulations should be guaranteed. (See Hay-Pauncefote Treaty.) On June 28, 1902, an act of Congress was approved empowering the President to acquire the rights and property of the Panama Canal Company at a cost not to exceed $40,000,000. It authorized him to purchase from the Republic of Colombia the necessary territory and to cause the construction of the canal at a cost not to exceed $130,000,000. If unable to secure a satisfactory title for this route, the President was instructed to build a canal by the Nicaragua route at a cost of not more than $189,000,000. Negotiations have been carried on with Colombia according to this act. The Hay-Herran Treaty, stipulating the terms on which the canal was to be constructed, was rejected by the Congress of Bogota in August, 1903. On October 18th Colombia proposed that the United States should pay her $25,000,000, and at the same time leave her in possession of the territory. The affair was complicated by the Isthmian revolution of November 4, 1903, which resulted in the declaration of independence of the State of Panama. The new republic was immediately recognized by the United States.

The commercial prosperity of the period was accompanied by a number of strikes, a most noteworthy occurrence in this connection being the appointment by the President in October, 1902, of a commission to arbitrate the differences between the striking anthracite miners and their employers.

In 1899 the inability of the Chinese Government to restrain the anti-foreign movement on the part of its subjects and to maintain internal order endangered the interests of the United States, as well as those of other Powers. The United States joined the other Powers in the work of restoring the Chinese Government and procuring indemnity for losses incurred. The policy of the United States throughout was the preservation of Chinese territorial and administrative unity and the maintenance of fair and impartial trade conditions. See China.

On October 20, 1899, a *modus vivendi* in connection with the Alaskan boundary controversy was arranged with Great Britain. After futile negotiations, in January, 1903, Secretary Hay and the British Ambassador signed a convention providing for the reference of the dispute to a tribunal of six impartial jurists. On October 17, 1903, the tribunal decided the main points of the controversy in favor of the United States, the decision being signed by the three American arbitrators, Lodge, Root, and Turner, and by the English arbitrator, Lord Alverstone. The refusal of the two Canadian members to agree with the majority was strongly approved in Canada, where the decision was received with marked evidences of dissatisfaction.

Bibliography. General Works and Physical Features. Reclus, *Nouvelle géographie universelle*, vols. xv.-xix. (Paris, 1890-94); Whitney, *The United States Physical Geography* (Boston, 1889); MacCoun, *Historical Geography of the United States* (New York, 1892); Sievers, *Amerika, eine allgemeine Landeskunde* (Leipzig, 1894); Shaler, *United States of America* (New York, 1894); id., *Nature and Man in America* (ib., 1897); Gannett, *North America—United States* (London, 1898); Dawson, *North America* (ib., 1897); Judson, *The Growth of the American Nation* (ib., 1897); *The Physiography of the United States*, ten monographs (New York, 1898); Russell, *Lakes of North America* (Bos-

ton, 1895); id., *Rivers of North America* (ib., 1898); Dupont, *Notions de géographie générale et géographie physique, ethnographique, politique et économique du continent américain* (Paris, 1900); Tarr and McMurry, *North America* (New York, 1900); Wilson, *The New America* (London, 1902); Brigham, *Geographic Influences in American History* (Boston, 1903); *National Geographic Magazine* (Washington, 1888 et seq.); *United States Geological and Geographical Survey Reports* (Washington, 1867-90); *American Geographical Society Bulletin* (New York, 1859 et seq.); *United States Hydrographic Office Publications* (Washington, 1867 et seq.).

CLIMATE. Bell, *Climatology and Mineral Waters of United States* (New York, 1885); Greely, *American Weather* (ib., 1888); *United States Weather Bureau Report* (Washington, 1891 et seq.); *Monthly Weather Review* (ib., 1891 et seq.).

FLORA. *Synoptical Flora of North America* (New York, 1878); Meehan, *The Native Flowers and Ferns of the United States* (Boston, 1878-80); Goodale, *The Wild Flowers of America* (ib., 1887); Beal, *Grasses of North America*, vol. ii. (London, 1886 et seq.); Michaux, *North American Silva* (Boston, 1887); Newhall, *The Trees of Northeastern America* (New York, 1891); id., *The Vines of Northeastern America* (ib., 1897); Sargent, *The Silva of North America* (Boston, 1891 et seq.); Britton and Brown, *Illustrated Flora of Northern United States* (New York, 1896-98); Heller, *Catalogue of North American Plants* (Lancaster, 1900); many articles in *United States War Department Reports of Exploration to the Pacific* (Washington, 1856); *United States Division of Botany Report* (ib., 1893 et seq.).

FAUNA. Audubon, *Birds of America* (New York, 1840-44); Agassiz, *Contributions to Natural History of United States* (Boston, 1857); Cassin, Baird, and others, *The Birds of North America* (Salem, 1870); Wallace, *Geographical Distribution of Animals* (New York, 1876); Goode, *American Fishes* (ib., 1888); Coues, *Key to North American Birds* (Boston, 1887); Maynard, *Manual of North American Butterflies* (ib., 1891); id., *Wild Fowl of North America* (ib., 1898); Jordan and Evermann, *Fishes of North and Middle America* (Washington, 1901-02); Apgar, *Birds of the United States* (New York, 1890); Ridgway, *The Birds of North and Middle America* (Washington, 1901-02); Howard, *The Insect Book* (New York, 1901); Dyar, *List of North American Lepidoptera* (Washington, 1902); Stone and Cram, *American Animals* (New York, 1902).

GEOLOGY. Tarr, *Economic Geology of the United States* (New York, 1894); Geikie, *The Great Ice Age* (ib., 1895); Powell, *Canyons of the Colorado* (ib., 1895); Russell, *Volcanoes of North America* (ib., 1897); id., *Glaciers of North America* (Boston, 1898); Weeks, "Bibliography and Index of North American Geology," in *United States Geological Survey Bulletin 130* (Washington, 1892-93); *United States Geological Survey Bulletins* (ib., 1884 et seq.); *United States Geological Survey Monographs* (ib., 1890 et seq.); *Journal of Geology* (Chicago, 1893 et seq.); also Dana's *Manual of Geology*, 4th edition; *American Geologist* (Minneapolis); *Bulletin of Geological Society of America*.

MINING. *Mineral Resources of the United States* (annual, Washington); Rothwell, *The Mineral Industry, Its Statistics, etc., in the United States and Other Countries* (annual, New York); Kemp, *The Ore Deposits of the United States* (New York, 1893). AGRICULTURE. *Report of the Department of Agriculture* (Washington); Oetkin, *Die Landwirtschaft in den Vereinigten Staaten* (Berlin, 1893); Levasseur, *L'Agriculture aux Etats-Unis* (Paris and Nancy, 1894); Rousiers, *La vie américaine; ranches, fermes et usines* (Paris, 1899). FORESTS. Mayr, *Die Waldungen von Nordamerika* (Munich, 1890); Bruncken, *North American Forests and Forestry* (New York, 1900). MANUFACTURES. Bagnall, *Textile Industries of the United States* (Boston, 1893); Wright, *The Industrial Evolution of the United States* (Meadville, Pa., 1895); Rocheleau, *Great American Industries* (Chicago, 1898); *United States Industrial Commission Reports* (Washington, 1900 et seq.); Jeans, *American Industrial Conditions and Competition* (London, 1902); Lawson, *American Industrial Problems* (Edinburgh, 1903); Goldberger, *Das Land der unbegrenzten Möglichkeiten* (Berlin, 1903); Taussig, *Tariff History of the United States* (New York, 1898); *Reports of the Commissioner of Labor* (annually, Washington); *Report of the Twelfth Census*, vol. x., "Manufactures" (Washington, 1902).

COMMERCE: TRANSPORTATION. Poor, *Manual of the Railroads of the United States* (London, 1868 et seq.); Ringwalt, *Development of Transportation Systems in the United States* (Philadelphia, 1888); Depew, *1795-1895. One Hundred Years of American Commerce* (New York, 1895); Vanderlip, *The American Commercial Invasion of Europe* (ib., 1903); *United States Treasury Department Report on Commerce and Navigation* (Washington, 1844 et seq., 1888 et seq.); *United States Interstate Commerce Commission Report* (ib., 1888 et seq.); *United States Special Consular Reports* (ib., 1890 et seq.); *United States Foreign Commerce Bureau Report* (ib., 1856 et seq.).

GOVERNMENT. Tocqueville, *On Democracy in America*, trans. by H. Reeve (London, 1889); Bryce, *The American Commonwealth* (ib., 1893-1895); Scudder (editor), *American Commonwealths* (Boston, 1884 et seq.); Howard, *Local Constitutional History of the United States* (Baltimore, 1885); Giddings, *Democracy and Empire* (New York, 1900); Ostrogorski, *Democracy and the Organization of Political Parties* (ib., 1902); Zueblin, *American Municipal Progress* (London, 1902); Wilson, *The State* (revised edition, Boston, 1901; first issued 1889).

FINANCE. The best work on the history of the United States finances is Dewey, *Financial History of the United States* (New York, 1903). Consult also Bullock, *Finances of the United States, 1775-1789* (Madison, 1895), and Noyes, *Thirty Years of American Finance* (New York, 1898). For statistics, consult *Reports of the Secretary of the Treasury of the United States*, 1789-1849, and *Report on the Finances*, issued annually, beginning with 1849. Statistics of the finances may also be conveniently obtained from the *Statistical Abstract of the United States*, first issued 1878.

DEFENSE. Nelson, *The Army of the United States* (London, 1897); *Annual Reports United States War Department* (Washington, annual);

Kelly, *The American Navy* (ib., 1897); Spears, *History of Our American Navy* (New York, 1897-99); Morris, *The American Navy* (London, 1898); Marvin, *American Merchant Marine* (ib., 1902); Long, *The New American Navy* (New York, 1903); *United States Navy Department Annual Reports* (Washington, 1822 et seq.); *United States War Department Annual Reports* (ib., 1845 et seq.).

IMMIGRATION. *Report of Commissioners of Immigration* (Washington).

EDUCATION. Boone, *Education in the United States* (New York, 1889); Butler, editor, *Education in the United States* (Albany, 1900); *Four American Universities* (New York, 1895); Gilman, *University Problems in the United States* (ib., 1898); *United States Commissioner of Education Reports* (Washington, 1867 et seq.).

HISTORY. For more or less elaborate bibliographies, consult: Winsor, *Narrative and Critical History of America* (Boston, 1886-89); Larned (ed.), *The Literature of American History. A Bibliographical Guide* (Boston, 1902); Channing and Hart, *Guide to the Study of American History* (ib., 1896); and Adams, *Manual of Historical Literature* (New York, 1889).

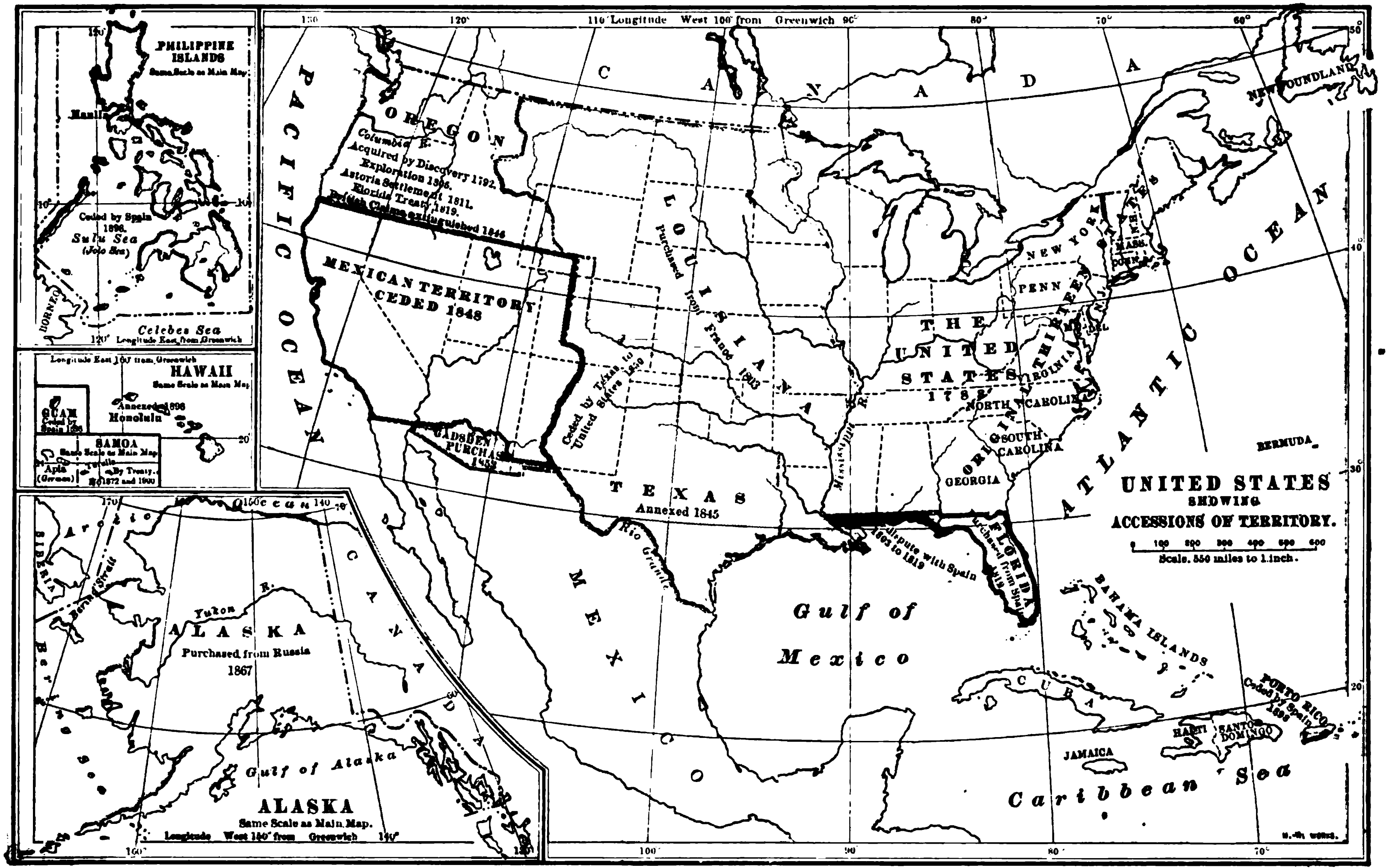
Standard works are the histories by Bancroft [to 1789] (revised ed., New York, 1883-85); Hildreth [to 1821] (revised ed., ib., 1882); Bryant and Gay (last ed., ib., 1896); Winsor (supra); McMaster [from the Revolution to the Civil War] (New York, 1883—); Schouler [to 1865] (id., 1899); Rhodes [from the Compromise of 1850] (ib., 1893—); Henry Adams [during the administrations of Jefferson and Madison] (ib., 1889-91); Von Holst, *The Constitutional and Political History of the United States* (new ed., Chicago, 1899); Curtis, *Constitutional History of the United States* (New York, 1889-96); Thorpe, *The Constitutional History of the American People 1776-1850* (Chicago, 1898); Wilson, *History of the American People* (New York, 1902); vol. vii. of the *Cambridge Modern History* (Cambridge, 1903); and the works of Parkman (q.v.), and of John Fiske (q.v.).

On the Colonial period consult, besides several of those already mentioned, Doyle, *The English in America* (London, 1882-87); Lodge, *Short History of the English Colonies in America* (New York, 1881); Tyler, *History of American Literature 1607-1765* (rev. ed., New York, 1897); Palfrey, *Compendious History of New England to the First General Congress of the Anglo-American Colonies* (Boston, 1865-73). For further references see bibliographies under the titles of the various States. On the Revolutionary War and the War of 1812: Fiske, *The American Revolution* (1891); Botta, *History of the War of the Independence of the United States* (8th ed., New Haven, 1840); Trevelyan, *The American Revolution* (London, 1899); Carrington, *Battles of the American Revolution* (New York, 1876); Roosevelt, *The Naval War of 1812* (ib., 1882); and Maclay, *History of the United States Navy from 1774* (ib., 1897-1900). Further references are given under titles of different battles, and of men prominent in the two wars.

For further references to works on the history of the United States, see the bibliographies to special articles, such as LOYALISTS; MEXICAN WAR; CIVIL WAR; CONFEDERATE STATES OF AMERICA; RECONSTRUCTION, etc.; and the bibliographical notes appended to articles on the various States, and to biographical sketches of prominent men.

UNITED STATES, EXTENSION OF THE TERRITORY OF THE. Prior to 1781 only six of the thirteen original States, viz. New Hampshire, Rhode Island, New Jersey, Pennsylvania, Maryland, and Delaware, had exactly defined boundaries. Of the remaining seven States, some claimed to extend to the Pacific Ocean and others to the Mississippi River. The States with inexact bounddaries ceded to the General Government their claims to lands west of their present limits in succession, as follows: March 1, 1781, New York; March 1, 1784, Virginia, the cession including the territory which now forms the State of Kentucky and the parts of the States of Ohio, Indiana, and Illinois which lie south of the forty-first parallel, Virginia, however, reserving from this cession for military-bounty lands the entire territory, 6570 square miles, between the Scioto and Little Miami rivers, from their sources to the Ohio River; April 19, 1785, Massachusetts, including her claims to territory west of the present boundary of New York; September 14, 1786, Connecticut, the cession being the territory west of the Alleghanies between the parallels of 41° and 42°, except a strip 120 miles in length lying directly west of Pennsylvania retained for the benefit of her public schools and later known as the Western Reserve (q.v.), which she ceded to the United States in 1800; August 9, 1787, South Carolina, the territory ceded being a strip of land about 12 miles wide, south of the thirty-fifth parallel and extending along the southern boundaries of North Carolina and Tennessee to the Mississippi; February 25, 1790, North Carolina, the territory ceded constituting what is now Tennessee; June 16, 1802, Georgia, after receiving that part of the cession of South Carolina lying within her present limits, ceding all between her present western boundary and the Mississippi, and between the South Carolina cession and the thirty-first parallel, embracing a large part of what is now Mississippi and Alabama. The foregoing cessions secured to the General Government nearly all territory ceded by Great Britain, not included in the original thirteen States, as in the main now bounded. On November 25, 1850, the State of Texas ceded all her claims to lands west of the twenty-sixth meridian west of Washington (103d Greenwich) and between latitudes 32° and 36° 30′.

CESSIONS BY FOREIGN POWERS. In the treaty of September 3, 1783, with Great Britain the western limits of the United States were declared to be the Mississippi River to the thirty-first parallel. On April 30, 1803, by treaty with France, the 'Province of Louisiana' was acquired. (See LOUISIANA PURCHASE.) Its western boundary as finally adjusted, February 22, 1819, by treaty with Spain, ran up the Sabine River, to and along the seventeenth meridian (94th Greenwich), to and along the Red River, to and along the twenty-third meridian (100th Greenwich), to and along the Arkansas River, to and along the Rocky Mountains, to and along the twenty-ninth meridian (106th Greenwich), to and along the forty-second parallel, to the Pacific Ocean. Its northern boundary conformed to the boundary established



COPYRIGHT, 1903, BY DODD, MEAD & COMPANY

between the British possessions and the United States. On the east it was bounded by the Mississippi as far south as the thirty-first parallel, where different boundaries were claimed. The United States construed the cession of France to include all the territory between the thirty-first parallel and the Gulf of Mexico, and between the Mississippi and Perdido, the latter of which is now the western boundary of Florida. Under this construction of the cession, the 'Province of Louisiana' is now covered by those portions of the States of Alabama and Mississippi which lie south of the thirty-first parallel; by Louisiana, Arkansas, Missouri, Iowa, Minnesota west of the Mississippi, Kansas, Nebraska, North and South Dakota, Montana, Idaho, Oregon, Washington, and the Indian Territory; and by the portion of Colorado lying east of the Rocky Mountains and north of the Arkansas River, and that portion of Wyoming lying east of the Rockies and south of the forty-second parallel. Spain, from which power France had acquired Louisiana by treaty in 1800 (see SAN ILDEFONSO, TREATY OF), claimed that she had ceded to France no territory east of the Mississippi except the 'Island of New Orleans,' and also contended that her Province of West Florida included all of the territory south of the thirty-first parallel and between the Perdido and Mississippi, except the 'Island of New Orleans.' Under this construction, the 'Province of Louisiana' included on the east of the Mississippi only the territory bounded on the north and east by the "rivers Iberville and Amite and by the lakes Maurepas and Pontchartrain." By the treaty of 1803 the national territory was increased by 1,171,931 square miles. The extreme northwestern portion of this territory was claimed by Great Britain, with which power the United States concluded the Northwest Boundary Treaty in 1846. By the treaty of February 22, 1819, Spain formally ceded the territory now covered by Florida, by those portions of Alabama and Mississippi which lie south of the thirty-first parallel, and by that portion of Louisiana which lies east of the Mississippi and is not included in the 'Island of New Orleans.' This territory was styled by Spain the 'provinces of East and West Florida.' Previous to this cession, by the authority of the joint resolution of January 15, 1811, and the acts of January 15, 1811, and March 3, 1811, passed in secret session and first published in 1818, the United States had taken possession of the East and West Floridas. In fact, as early as 1810 the Americans controlled all of West Florida except Mobile, while in 1814 Jackson temporarily seized Pensacola, and again in 1818 occupied both Pensacola and Saint Marks. The United States, however, did not take formal possession until 1821. After prolonged negotiations, and a vigorous political contest, Texas, formerly a portion of Mexico, and later an independent republic, was admitted to the Union by a joint resolution of Congress, approved by President Tyler on March 1, 1845. As a result of the Mexican War (q.v.), by the Treaty of Guadalupe Hidalgo (q.v.), on February 2, 1848, Mexico ceded the territory now covered by California and Nevada, also her claims to the territory covered by the present Texas, by Utah, by the bulk of Arizona and of New Mexico, and by portions of Wyoming and Colorado. That part of Arizona and that part of New Mexico lying south of the Gila and known as the Gadsden Purchase were ceded by Mexico on December 30, 1853. By treaty of March 30, 1867, Russia ceded Alaska. At the close of the Revolutionary War the territory really occupied by the old thirteen States covered scarcely a quarter of a million square miles, and after the treaty of 1783 the nation occupied only 825,000 square miles, but in 1867 the territory belonging to the United States had an area in round numbers of 3,561,000 square miles. A further accession was effected in 1898, when, on July 6th, Congress passed a joint resolution annexing Hawaii (q.v.) to the United States. In the following year negotiations were concluded by which the island of Tutuila, Samoa, on which is located the excellent harbor of Pago-Pago, was ceded absolutely to the United States. An important accession of territory was that incident to the Spanish-American War (q.v.), and formally effected in the treaty of December 10, 1898, in accordance with which Spain ceded Porto Rico (q.v.) and the Philippine Islands (q.v.), together with the island of Guam (q.v.), to the United States.

BIBLIOGRAPHY. The most important volume in this connection, with all the texts, is the *Treaties and Conventions*, published by the Government (Washington, 1889). Some useful maps illustrating these treaties are to be found in *The United States of America, 1765-1865*, by Channing (New York, 1896). Consult also, as to treaty of 1803, Adams, *History of the United States*, vol. ii., and Roosevelt, *Winning of the West*, vol. iv. Of special works, consult: Adams, *Maryland's Influence on the Land Cessions* (Baltimore, 1885); Gannett, *Boundaries of the United States;* Garrett, *South Carolina Land Cession;* Donaldson, *Public Domain* (Washington, 1884); and the appendix to vol. vii. of Winsor, *Narrative and Critical History of America* (Boston, 1886-89).

UNITED STATES, LITERATURE OF THE. See AMERICAN LITERATURE.

UNITED STATES CHRISTIAN COMMISSION. An organization kindred to the United States Sanitary Commission (q.v.), formed during the Civil War in America for the purpose of promoting the spiritual and physical welfare of Federal soldiers and sailors. A convention of Young Men's Christian Association delegates met in New York City in November, 1861, and formally organized the United States Christian Commission of 12 members with George H. Stuart, a Philadelphia philanthropist, as president, and B. F. Manierre, of New York, as secretary. Contributions of money, literature, and supplies were asked for and a generous response was made. The central office of the commission was in Philadelphia, but it had branches in all of the large towns and cities, and its agents followed the armies. Temporary libraries were established, chapels for religious worship were erected at permanent camps, and Christian burial was accorded to the dead, whose graves were suitably marked by agents of the commission. The American Bible and Tract societies gave enormous quantities of their publications to the commission for distribution; the Government furnished free transportation to its agents, and for its supplies, while the telegraph and transportation companies furthered its efforts in various ways. The following is a general summary of the work of the commission for the four years of the war: Delegates commissioned, 4859; Bibles and Testaments distributed, 1,466,748; hymn and Psalm books distributed, 1,370,053; knapsack books distributed, 8,308,052; bound library books distributed, 296,816; magazines and pamphlets distributed, 767,861; newspapers distributed, 18,126,002; tracts distributed, 39,104,243; sermons preached and prayer meetings held, 136,152; letters written by delegates, 92,321; cash receipts, $2,524,512; value of stores donated, $2,839,445; value of publications donated, $300,000. Consult Moss, *Annals of the United States Christian Commission* (Philadelphia, 1868).

UNITED STATES DAUGHTERS OF 1812. A patriotic society founded in Cleveland, Ohio, in 1892, and incorporated as a national organization February 25, 1901. It has for its object the perpetuation of the memory of the founders of America, with their records of service in the French War, the Revolution, and the War of 1812. It admits to membership women who are lineal descendants from an ancestor who assisted in the War of 1812, either as a military or naval officer, a soldier, or a sailor, or in any way gave aid to the cause. The membership is slightly over 1000.

UNITED STATES FLAG. See Flag.

UNITED STATES MILITARY ACADEMY. See Military Academy, United States.

UNITED STATES NATIONAL MUSEUM. A national depository at Washington, D. C., under the control of the Smithsonian Institution (q.v.). The collections of the Smithsonian Institution, beginning with the private cabinet of James Smithson, and added to by the material deposited by various exploring expeditions, increased rapidly and soon filled the Smithsonian Building. When the Centennial Exposition, held in Philadelphia in 1876, was first considered, it was decided to make extensive exhibits, showing the development of the various governmental departments, and large collections were made for that purpose, which at the close of the Exposition were turned over to the National Museum, together with the choicest of the exhibits from 34 foreign governments. A building for the exhibition of these collections was authorized by Congress in 1879 and completed in 1881, and in 1903 Congress again authorized the construction of a building to cost $3,500,000. As at present organized, the National Museum is under the direction of the Secretary of the Smithsonian Institution as keeper *ex officio*, and in the direct charge of an assistant secretary, under whom are 18 curators in charge of special branches of science. A series of publications are issued by the National Museum, and include: (1) *Annual Report of the Smithsonian Institution*, part ii. begun in 1884; (2) *Bulletin of the United States National Museum*, begun in 1875 and now numbering 52; with these should be included the series of *Special Bulletins*, four in number; (3) *Proceedings of the United States National Museum*, which were begun in 1878 and now include 26 volumes. These were intended primarily as a medium of publication for newly acquired facts in science, descriptions of new forms of animals and plants acquired by the museum, etc. A complete list of these publications with index to titles was issued as *Bulletin No. 51*, in 1902. The National Museum is supported by an annual appropriation from Congress.

UNITED STATES NAVAL ACADEMY. See Naval Academy, United States.

UNITED STATES VETERAN NAVY. A patriotic society organized September 21, 1899. Eligible for membership are all persons who as commissioned officers or enlisted men were connected with any branch of the naval service of the United States during the Civil War or the Spanish-American War, or who in the future shall be engaged, as members of the navy, in war against an enemy of the United States. The society is organized into 11 squadrons, and has a total membership of about 3000.

UNITED WORKMEN, Ancient Order of. A fraternal benevolent order founded at Meadville, Pa., in 1868. The constitution provided that only white persons were eligible as members and that when the first 1000 should be enrolled an insurance feature should be added guaranteeing the payment of $500 on the death of the insured member. This amount was later increased to $2000. In 1895 the membership had reached 320,000 in the United States, and up to that date the order had paid to the beneficiaries of deceased members $70,000,000. The governing body of the order is the Supreme Lodge, which controls the dispensation of death benefits in States where there is no Grand Lodge. The subordinate lodges are controlled by the Grand or State Lodge. The payment of sick and funeral benefits is optional with each lodge.

UNITED ZION'S CHILDREN. See River Brethren.

UNITIES, Dramatic. Three classical qualities of a drama, the unities of time, place, and action. See Drama.

UNITY OF CONSCIOUSNESS. A phrase used to denote the coherence running through the mental experience of the individual. One element of this unity consists in the relation which one part of experience bears to another, and a second element in the specific reference of experiences to the self. (See Self; Self-Consciousness.) Systematic arrangement of knowledge corresponds to one phase of the unitariness in question. The reference of experience to the self may be numbered among the mental functions. The notion of self is a matter of growth and elaboration, and no single group of processes can be pointed to as forming the 'I.' There is, however, one set of processes which is peculiarly important, at least in the earlier stages of development, in 'holding mind together,' in maintaining the unity and permanence of consciousness; it is the complex of 'bodily feelings,' the organic sensations arising from nervous disturbances throughout the trunk. These sensations are relatively permanent and, at the same time vague, indefinite, and but little attended to. Their function in the 'centralization of consciousness' is attested by their neural substrate, which lies in the central part of the cortex and communicates with the 'association centres,' the motor apparatus, and the other sensory centres by an unusually large number of connective tracts. Consult: Ebbinghaus, *Psychologie* (Leipzig, 1902); Titchener, *Outline of Psychology* (New York, 1899); James, *Principles of Psychology* (ib., 1890); Flechsig, *Gehirn und Seele* (Leipzig, 1896).

UNIVERSALISM (from *universal*, from Lat. *universalis*, relating to all or the whole, from *universus*, OLat. *oinovorsus*, *oinvorsus*, *unvorsus*, all, whole, entire, turned into one, from *unus*, one + *vertere*, to turn). The name given to the religious faith of those who believe in universal salvation, or the doctrine that the Holy Scriptures declare it to be the purpose of God to make His grace, revealed through the Lord Jesus Christ, as extensive as sin is or can be; to make an end of everything averse to God and His law; to bring in everlasting righteousness and reconcile all souls to God that God may be all in all. Universalists claim for this interpretation of the Bible great Christian antiquity, citing in proof thereof the Sibylline Oracles (c.150), and the teaching of Clement of Alexandria (c.195), that man was created to be educated and not for a limited trial, that his opportunity for education is as lasting as his being, and that punishment is remedial. They find it in the teachings of Origen (c.185-c.254), and in the common belief among Christians of all sects in the second and third centuries that between the death and the resurrection of Jesus he went to the underworld and there taught the souls that had sinned in the days of Noah; these, argued Clement, included all who there or elsewhere need salvation. Universalists also believe that their faith was extensively held in the fourth century and that of the six theological schools then established in the Christian world, four (the schools of Alexandria, Cæsarea, Antioch, and Eastern Syria) taught it; that it was also fundamental in the fifth century in the teachings of Theodore of Mopsuestia, the founder of the Nestorian Church, in whose *Confession of Faith* and *Sacramental Liturgy* it is plainly declared that Maximus the Confessor (580-663) also taught and defended it in the sixth and seventh centuries, that Pope Gregory's instructions to his missionaries show its existence in the eighth century, and that in the ninth it was ably advocated by John Scotus Erigena. The subsequent period until the Lutheran Reformation was not favorable to any expression of thought that antagonized the Latin theology. The Church silenced by force all voices that repudiated its teachings and burned all books contaminated by so-called heresies. But, in spite of all this, Universalism was manifest in the teachings of such thinkers as Raynold, Almaric, Albertus Magnus, Solomon, Bishop of Bosra, Ruysbroek, Tauler, and John of Goch, and in the societies of the Lollards, Brethren of the Common Life, Brethren and Sisters of the Free Spirit, and the Men of Understanding. With the Reformation Universalism revived. The original 42 articles of religion, drawn up by the Reformers in England in 1552, declare: "They also deserve to be condemned who endeavor to restore that pernicious opinion that all men (though never so ungodly) shall at last be saved; when for a certain time, appointed by the Divine Justice, they have endured punishment for their sins committed." When the articles were reduced to 39 in 1571 this condemnatory article was omitted. Many of the Mystics, the German Baptists, the Mennonites in Holland, the French Protestants, the Moravians, and various smaller sects in the Old World, advocated Universalism.

It was not, however, until about 1750 that an organization called Universalist was created. Before that time the believers in universal salvation were affiliated with sects bearing various names and were spoken of as 'Origenists,' 'Merciful Doctors,' and by other names indicating their dissent from the dogma of the never-ending misery of the wicked; but at the date first given Rev. James Relly (q.v.) became a Universalist and organized a Universalist church in London, to which he ministered until his death, about thirty years later. At the present time very few churches in Europe bear the Universalist name, but the doctrine of Universalism finds favor, and in some instances open advocacy, in churches of various names. The Unitarians abroad are avowed Universalists.

The doctrine of Universalism was preached in America as early as 1636 by Samuel Gorton, the New England Mystic, and put forth in the speeches and writings of Sir Henry Vane, the younger, Governor of Massachusetts; by Dr. George de Benneville about a century later; by eminent Episcopalians; by prominent Congregationalists, such as Chauncey and Mayhew of Boston, and Huntington of Connecticut; and by many German Baptists. John Murray (q.v.), 'the father of Universalism in America,' came to New Jersey in September, 1770. On January 1, 1779, 15 persons who had been suspended from the First Parish Church in Gloucester, Mass., for becoming regular attendants on the preaching of Murray, united under "Articles of Association as the Independent Christian Church in Gloucester" for the defense and promulgation of their Universalist faith. Murray was not long without ministerial helpers. Elhanan Winchester, who had been an eminent Baptist preacher in Philadelphia, with more than 100 of his church in that city, was excommunicated for having become believers in Universalism; Adams Streeter and Caleb Rich, in New England, became preachers of the common salvation before they saw or knew Murray. Later, Hosea Ballou, repudiating all the old notions connected with trinitarian dogmas, became the first openly avowed American advocate of Unitarian views of Christ; put the emphasis of Christian theology on God's Fatherhood of the human race; and interpreted the teachings, sufferings, death, and resurrection of Jesus as designed, not to effect any change whatever in God, but to change man and bring him into harmony with his Heavenly Father. These views prevail in the Universalist Church to-day.

In 1803, at the annual session of the General Convention, in view of 'diversity of opinion' as to how universal salvation was to be the result of God's government, three 'Articles of Belief' were agreed upon as stating the basis of fellowship. At the session in 1899 the following action was taken in regard to profession of belief and the conditions of fellowship:

"I. The Profession of Belief adopted at the session at Winchester, N. H., A.D. 1803, is as follows: Article 1—We believe that the Holy Scriptures of the Old and New Testaments contain a revelation of the character of God and of the duty, interest, and final destination of mankind. Article 2—We believe that there is one God, whose nature is Love, revealed in one Lord Jesus Christ, by one Holy Spirit of Grace, who will finally restore the whole family of mankind to holiness and happiness. Article 3—We believe that holiness and true happiness are inseparably connected, and that believers ought to be careful to maintain order and practice good works; for these things are good and profitable unto men.

"II. The conditions of fellowship shall be as follows: (1) The acceptance of the essential principles of the Universalist faith, to wit: (a) The universal fatherhood of God; (b) the Spiritual authority and leadership of His Son, Jesus Christ; (c) the trustworthiness of the Bible as containing a revelation from God; (d) the certainty of just retribution for sin; (e) the final harmony of all souls with God. The Winchester Profession is commended as containing these principles, but neither this nor any other precise form of words is required as a condition of fellowship, provided always that the principles above stated be professed. (2) The acknowledgment of the authority of the General Convention and assent to its laws."

During the first hundred years of its existence, the denominational polity was congregational or independent, the several conventions possessing only advisory powers. Since 1870 the General Convention has had authority to make laws on the subject of fellowship, ordination, and discipline, to which all subordinate conventions, churches, and preachers must conform. Since 1890 a mission has been sustained in Japan with good success in conversions, the establishing of theological and literary schools and planting churches, and the distribution of literature. Four colleges and five academies erected and managed under the auspices of the denomination had in 1902 249 professors and teachers, 1896 students. The following theological schools are maintained: (1) The Canton Theological School, opened at Canton, Saint Lawrence County, N. Y., in 1858. Although affiliated with Saint Lawrence University, the theological school is a separate institution in its management and property. (2) Tufts Divinity School, a department of Tufts College, located at Medford, near Boston, opened in 1869. (3) At the beginning of the college year in 1881 a theological department was opened in Lombard College, Galesburg, Ill. In honor of the late Rev. William Henry Ryder, who had endowed the school, its name was changed to the Ryder Divinity School in 1890.

The Church statistics for 1903 show 871 church organizations with 53,508 communicants, 773 Sunday schools with 57,529 members, and church property valued at $10,158,453. The number of preachers is 750. The Young People's Christian Union has about 10,000 members.

BIBLIOGRAPHY. The denominational literature is very extensive. The following works may be mentioned: Winchester, *The Universal Restoration, Exhibited in Four Dialogues between a Minister and His Friend* (Philadelphia, 1792); Murray, *Universalism Vindicated* (Charlestown, 1797); Foster, *A Critical and Candid Examination of a Late Publication Entitled the Doctrine of Endless Misery Reconcilable with the Infinite Benevolence of God* (Walpole, N. H., 1803); Hosea Ballou, *A Treatise on Atonement* (Randolph, Vt., 1805); Hosea Ballou, 2d, *The Ancient History of Universalism* (Boston, 1829); Whitemore, *The Modern History of Universalism* (ib., 1830); Smith, *Historical Sketches and Incidents Illustrative of the Establishment and Progress of Universalism in the State of New York* (Albany, 1843-44); Cobb, *A Compend of Christian Divinity* (Boston, 1846); Thayer, *Theology of Universalism* (ib., 1862); Thomas, *A Century of Universalism in Philadelphia and New York* (Philadelphia, 1872); Eddy, *Universalism in America, 1836-1886* (Boston, 1884-86), with full bibliography; id., *Universalism from Apostolic Times to 1893*, vol. x. of the "American Church History Series" (New York, 1894). There are also a number of published discussions and debates between advocates and opponents of Universalism, as those by Ely and Thomas (New York, 1835); by Campbell and Skinner (Utica, N. Y., 1840); by Holmes and Austin (Auburn, N. Y., 1848); by Sawyer and Westcott (New York, 1854). The chief periodical of the Church is the *Universalist Leader*, issued weekly by the Universalist Publishing House, Boston.

UNIVERSAL LANGUAGE. A phrase applied in the specific sense to languages artificially formed for the purpose of ready communication by persons whose natural language is different. The aim is to do away with the difficulties and irregularities with which historical accidents have encumbered the existing languages, and to construct, out of old materials or new materials, a language so simple and regular that any learner of any nation can acquire it with ease, and use it with precision. Most of the schemes proposed are meant to serve the purposes of business, travel, and correspondence; not to displace the existing languages, nor to serve as vehicles of literary expression.

A definite attempt at the formation of a scientific language was made by Bishop Wilkins in his *Essay Toward a Real Character and a Philosophical Language* (London, 1668). This was a classification of ideas and of words by ideas, and a scheme of characters, much like shorthand, to represent them. Various other schemes appeared, but none attracted serious attention. It was not till the last quarter of the nineteenth century that the time was ripe for a serious effort at either a scientific or a universal language. At that time the history and nature of language were better known, and the number of students of language was great enough to furnish, in the proportion interested, an intelligent public to receive such proposals.

Accordingly, when Johann Martin Schleyer published, in 1879, his famous 'world-speech,' Volapük, it attracted wide attention. (See VOLAPÜK.) The impulse given by Schleyer moved other inventors; and in a few years more than a dozen 'international languages' were put forth. The chief schemes were: (1) 'La lingvo internacia' ('Internationale Sprache'), by Dr. L. Zamenhof, under the pseudonym of 'Esperanto,' which name was later attached to the language itself, Warsaw, 1894; (2) 'Kosmos,' by Eugene A. Lauda, Berlin, 1894; (3) 'Spelin,' by Prof. G. Bauer, Agram, 1888; (4) 'Myrana,' by J. Stempfl, Kempten, 1889; (5) 'Lingua internationa' or 'Mondolingue,' by J. Lott, Vienna, 1890; (6) 'Universala,' by Dr. Eugene Heintzeler, Stuttgart, 1893; (7) 'Novilatiin,' by Dr. E. Beermann, Leipzig, 1895; (8) 'Idiom neutral,' by 'the International Academy of the Universal Language,' 1893-1903.

'Spelin' is formed on the same lines as Volapük, is simpler in its phonetic form and inflexional system, and is briefer. The first named, 'Esperanto,' after a long quiescence, has recently gained much attention, and has an active following in Europe and America. The phonetic basis of 'Esperanto' is the Latin alphabet, except *q* and *y*, and with the addition of five new letters (old letters with diacritical marks) for the sounds represented in English by *ch* (tsh), *j* or *g* or *dg* (dzh), *oh* (kh or χ), as in *loch*, *sh*, and *z* (*zh*), as in *azure*. The structure is simple. Every noun ends in *-o*, every adjective in *-a*. The present tense of verbs ends in *-as*, the past in *-is*, the future in *-os*. The conditional mode ends in *-us*, the imperative in *-u*, the infinitive in *-i*, the present participle in *-anta*, the past participle in *-inta*, the future participle in *-onta*. The persons are expressed by separate pronouns. Thus, *ami*, to love, *mi amas*, I love, *vi amis*, you loved, *li amos*, he will love, *ili amus*, they should love, etc. The vocabulary is taken mainly from Latin, with less change than Volapük allows. With a little practice, any educated person, who knows some Latin or French, can recognize nearly all the words. The context indicates the meaning of the more arbitrary words and the rest is easy. The language is, as it were, a 'composite photograph' of Latin, French, and Italian. English as such hardly appears.

The last-named scheme, the 'Idiom neutral,' developed out of Volapük, resembles 'Esperanto' in taking its vocabulary mainly from Latin or Romance, with the minimum of change; but it abandons the use of purely arbitrary formatives, preferring formatives taken from Latin or English. Thus *dom*, house, *domi*, houses. There are no case-endings at all, their place being supplied by prepositions (*de dom*, *a dom*, etc.). The verb goes thus: *Mi am*, I love, *vo am*, you love, etc., *mi amav*, I loved, *mi amero*, I shall love, *mi es amed*, I am loved, etc. The prepositions, conjunctions, etc., are chiefly adopted or adapted from Latin or French. The result is a 'composite photograph' of Latin and French, and the Latin side of English. The object of easy intelligibility is fairly attained. It is quite possible for an educated reader to read the 'Idiom neutral' upon ten minutes' sight, without the aid of either grammar or dictionary. So much of the text is intelligible on mere inspection that the rest may easily be inferred.

'Esperanto' and 'Idiom neutral' approach a principle which has been made since 1880 the basis of several attempts at an international language. That principle is to employ the historical Latin for the purpose, without mutilation or serious alteration, but with a free addition of modern terms in Latin form, and with a modernized syntax, the order of words, in particular, being conformed to that of the modern languages. In view of the universal use of the Latin vocabulary, with the Greek, as the basis of modern scientific nomenclature, and of the continued and inevitable use of Latin in all kinds of historical, literary, and ecclesiastical scholarship, the proposal to extend it, in an emancipated form, to the uses of ordinary international correspondence and commerce is not at all unreasonable.

Consult: Steiner, *Pasilingua* (Neuwied, 1885-88); Ellis, "On the Conditions of a Universal Language," in *Philological Society Transactions* (London, 1888); Bauer, *Der Fortschritt der Weltsprache-Idee* (Agram, 1888); Schleyer, *Volapük. Die Weltsprache* (Sigmaringen, 1881); id., *Volapük. Grammatik des Universalsprache* (4th ed., Ueberlingen, 1884); O'Connor, *Esperanto, the Universal Language* (New York, 1903); André, *Le latin: le problème de la langue internationale* (Paris, 1803). Monthly periodicals are *Lingvo internacia* (Paris); *L'Espérantiste* (Epernay).

UNIVERSALS. Characteristics or attributes of objects when regarded as common to an indefinite number of individuals. There have been philosophers who denied the real existence of universals (see NOMINALISM), and others who asserted that universals exist apart from and prior to the objects they qualify. See REALISM.

UNIVERSITY (Lat. *universitas*). A term which, as originally used, denoted any corporate body, community, or association regarded as a whole. In its modern sense, that of a corporate body devoted to study, teaching, and investigation, the term came into use in the fourteenth and fifteenth centuries. The institutions first so designated in this modern sense of the term came into existence some two centuries before the common use of the term, and others somewhat similar had existed in ancient times under Greco-Roman influence. There was at Athens, at the time of the Roman Empire, a university not only in all the essentials of a great centre of learning, but one that closely corresponded even to what we now mean by that word. Schools of philosophy and letters similar to those at Athens sprang up at other great cities of the Roman Empire—at Constantinople, at Alexandria, at Rhodes, at Marseilles, at Apollonia (Illyria), and at Rome itself. These, however, had little or no influence on mediæval institutions.

MEDIÆVAL UNIVERSITIES. The university, in a modern sense, originated during the twelfth and thirteenth centuries, as an outgrowth of schools which had existed prior to that time in connection with cathedrals and monasteries.

Throughout the eleventh and twelfth centuries there had grown up a new interest in dialectic, logic, and philosophy through the many theological controversies aroused by the earlier schoolmen and the heresies of the times; in Roman law through the controversies between the Holy Roman Empire and the Italian municipalities and the growing importance of canon law in Church administration; and in medicine on account of the Crusades and the contact with the East and with Saracen learning. When a teacher of eminence appeared, such as Abélard or Peter Lombard at Paris, or Irnerius at Bologna, a large number of students were attracted. This student body is said to have numbered 30,000 at Paris at the time of Abélard. Such a place of learning and concourse of students was called a *studium*, or later a *studium generale* to distinguish such a one from the more selected *clientèle* and function of the monastic or cathedral school. The addition of the subject matter of philosophy to the previous religious discussions, the new methods of treatment, and the greater freedom of thought were responsible for the building up of the first universities of Northern Europe, and the most influential of all mediæval universities, that of Paris.

The students were no longer necessarily destined for monastic or clerical life, though most of them were. At least the discipline was much less strict, and the students would not adapt themselves to the closely regulated life of monastery or cathedral. The students were no longer drawn from a restricted area, but were admitted from any region, and great numbers flocked to schools in foreign lands. Civil and canon law, medicine and theology were now added to the seven liberal arts.

The determining characteristic of the universities, however, was their specialization; each of the earlier universities was especially strong in some one line. At Salerno, in Southern Italy, in the early part of the eleventh century, the monks had given special instruction in medicine, and the fame of this new seat of learning spread with the First Crusade. During the twelfth century great attention was paid to the study of Roman law, especially in Northern Italy, where the instruction centred in Bologna, and notably so during the life of the great teacher Irnerius. In Paris theology was the subject of interest beyond all others, though the majority of students there were students of the liberal arts, not yet qualified for the study of theology.

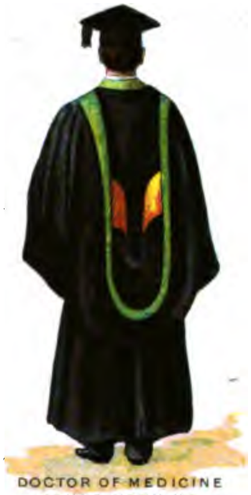
These groups of students and teachers, drawn together from the most distant regions, were controlled by no monastic rules, were amenable to no political authorities, and were practically without protection in their rights and privileges if any then existed. Organization was necessary, and the natural tendency was to organize on the basis of nationality. The 'nations' were the first organizations, and they, through their delegated officers, made the central organization of the body as a whole. Even before organization, as well as afterwards, such a body of students was termed a *studium generale*. To the organization the term *universitas* (corporation) was given, but never by itself alone. The terms most frequently used were *universitas magistrorum*, or *universitas magistrorum et scholarium*, or *universitatis collegium*. In the course of time the various nations and faculties, each at first a *universitas*, were united into one, the distinctions between the terms *studium generale* and *universitas* were lost sight of, and the latter term was used alone to indicate the general body instead of the constituent parts.

One great difference existed between the universities of Southern and those of Northern Europe. In the former, modeled as they were after Bologna, the students constituted the corporation; in the latter, modeled after Paris, the teachers controlled, if they did not always completely constitute, the corporation. The great reason for this distinction was that the students of the southern universities, especially those of Bologna, were mature students of law, capable of self-government, both on account of their age and the subject of study; while in the north they were the more youthful students of arts, many entering Paris at the age of twelve or thirteen.

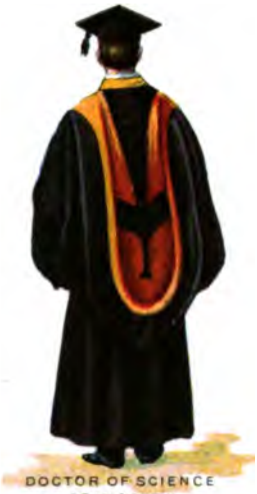
The privileges which built up the universities were either local, bestowed to prevent removal elsewhere, or general, constituting them integral parts of Church and State. The State exempted members of the universities from financial and military services, save under exceptional circumstances; the Church bestowed the privilege of clergy, and above all the right to teach. When the student had demonstrated his ability to 'determine' and to 'define' the terms in the prescribed trivial (see TRIVIUM) texts he received the bachelor's degree. When he had demonstrated his ability to conduct a 'disputation,' that is, an exposition of the more advanced texts, through a public defense of a thesis, the master's or doctor's degree was conferred. This entitled the recipient to teach within the limits of the university. Toward the end of the thirteenth century Pope Nicholas III. granted to the University of Paris the right of endowing its graduates with the power of teaching everywhere, a privilege later conferred upon most universities. The degrees themselves were similar to and probably borrowed from the corresponding stages in the learning of a craft or in the organization of chivalry. The earlier stage was an apprenticeship, the close of which was marked by the conferring of the bachelor's degree; the following was a journeyman's period, during which the candidate pursued his studies, and at the same time practiced his art by teaching the younger students the trivial studies. The master or doctor had the right to teach at least in his own and usually in any university, and during the earlier period he was under obligations to teach in his own. In the course of time it became customary to endow a select number of the graduates as permanent public teachers; these privileged and salaried graduates were designated professors, and instruction by professors more or less supplanted the original plan of teaching by graduates. The *privat-docent* of the German universities now represents the modification of the old regent graduates.

The term 'faculty' was originally used in the most general sense of science or knowledge; later to indicate a department of study, as the Faculty of Arts. Then a more special connotation became not unusual, as synonymous with the 'consortum magistrorum' or 'council of masters.' By ordinary usage, however, the term was applied to the subordinate corporation of masters, or of masters and students in particular departments of learning. The University of Paris had at first only a Faculty of Arts, which existed in an organized form as early as 1169. In the thirteenth century Faculties of Theology, Medicine, and Canon Law were added. These, with the Faculty of Civil Law, constituted the organization of the typical mediæval university, though not all universities had all faculties represented even at the Renaissance period. The primary units of organization of the universities were the nations, though by the fourteenth and fifteenth centuries these were succeeded in importance by the faculties. In Paris the Faculty of Arts was divided into four nations, known as French, Picard, Norman, and German or English. After the thirteenth century these four nations, under their respective procurators, and the three faculties subsequently added, under their deans, constituted the seven component parts of the university. The procurators and deans elected the rector of the university, its highest officer, who possessed executive authority of a delegated nature. The rector with

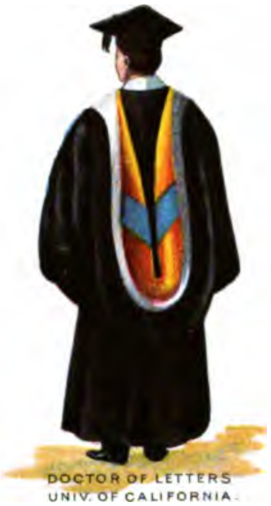
ACADEMIC GOWNS – AMERICAN USAGE.



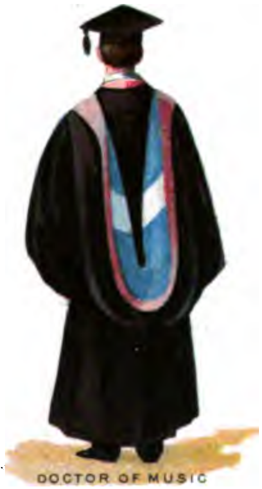
DOCTOR OF MEDICINE
JOHNS HOPKINS.



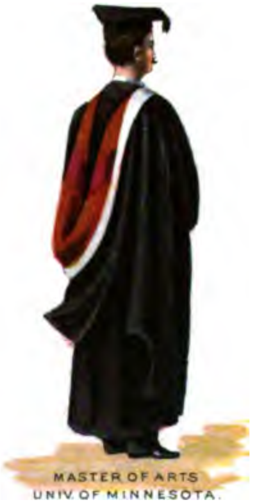
DOCTOR OF SCIENCE
PRINCETON.



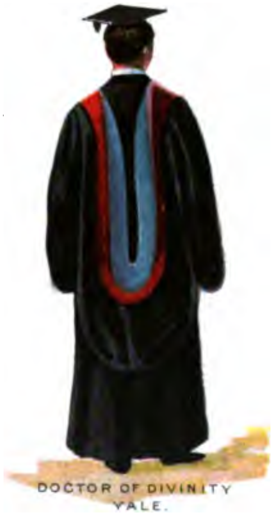
DOCTOR OF LETTERS
UNIV. OF CALIFORNIA.



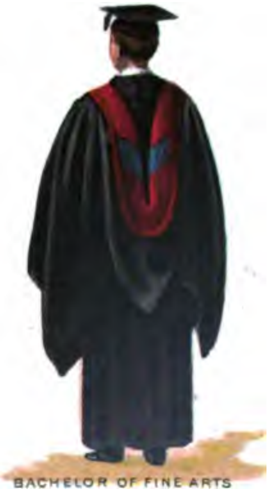
DOCTOR OF MUSIC
COLUMBIA.



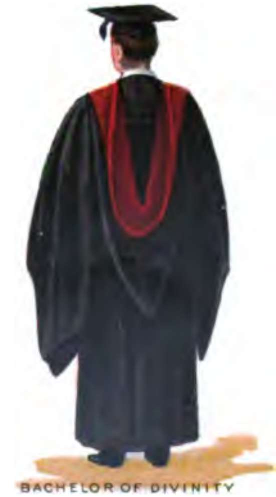
MASTER OF ARTS
UNIV. OF MINNESOTA.



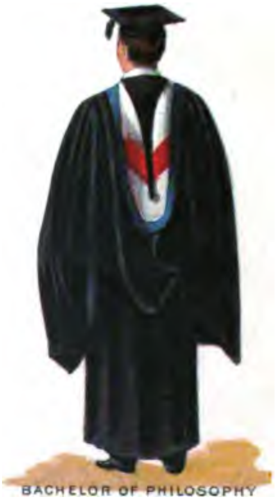
DOCTOR OF DIVINITY
YALE.



BACHELOR OF FINE ARTS
UNIV. OF PENNSYLVANIA.



BACHELOR OF DIVINITY
UNIV. OF CHICAGO.



BACHELOR OF PHILOSOPHY
WESTERN RESERVE UNIV.

COPYRIGHT, 1903, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO LITH N Y

ARRANGED BY GARDNER COTRELL LEONARD, B A., INTERCOLLEGIATE BUREAU, ALBANY, N.Y.

the procurators and the deans formed a court having cognizance of all matters relating to discipline, from which there was an appeal to the university and thence to the Parliament of Paris. The chancellor, after the rector, was the highest in authority, though that authority was confined to the conferring of degrees. Originally the chancellor was the immediate representative of the archbishop to whom had previously belonged the right of conferring the privilege of teaching. The details of organization, as well as the designation of the officers, varied considerably in the early universities, though in general they were all modeled on Paris or Bologna. In the latter city the *universitates* were to be distinguished from the *collegia*. The former were two in number, the *ultramontani* and the *citramontani*, which were composed exclusively of the students of law organized into constituent nations, thirteen in one case and fourteen in the other, each presided over by its procurator and counselors. The *collegia* were organizations of professors and doctors that had control of the conferring of degrees. These colleges were of the Doctors of Civil Law, Doctors of Canon Law, Doctors of Medicine, and, from the middle of the fourteenth century, Doctors of Theology. The general control of the Studium Generale, however, was in the hands of the universities later combined into one.

The colleges, as they developed in other countries, were quite different institutions from those of Bologna. They arose through provisions that were made for poor students in connection with hospitals or monastic foundations. The necessity for some more domestic supervision of young students, combined with the other tendency, led to the foundation of Halls. These in turn were endowed with corporate privileges as well as property, and the term college, previously a general term as *universitas* itself had been, was appropriated by these institutions. They soon assumed the character of boarding houses for all classes of students, where they were privately trained and prepared for public lectures. In some universities the lectures came to be given in the college, first the extraordinary, then the ordinary, until the general university lectures almost disappeared, and no student was admitted except as a member of a college. Many of these colleges were identified with particular faculties, or even departments of faculties. Probably the earliest college of all, which served as a type for the others, was the college of the Sorbonne (q.v.), founded about 1250 in the University of Paris, which came to be identified with the theological faculty.

Details concerning the early history of the universities, their development and their present organization will be found in the articles on the individual universities. The early organization of universities has been best adapted to the needs of the present by the German universities, and is more specifically treated in that section.

ENGLISH UNIVERSITIES. These are of two distinct types: those that date from the Middle Ages, Oxford and Cambridge, and those founded during the nineteenth century. The two former have had a profound influence upon national development and national life, for in no other country have universities been more intimately connected with the religious, political, and literary development. The details of the history and present organization of these two universities, with the literature of the subject, will be found under the titles OXFORD UNIVERSITY and CAMBRIDGE, UNIVERSITY OF. During the nineteenth century four universities of the modern type were founded, all laying stress on the study of the sciences and the technical branches. These are Durham University, founded in 1832; University of London, founded in 1836; Victoria University, founded in 1880; and Birmingham University, founded in 1900. The first is treated under DURHAM and the second and third appear under their respective titles. Birmingham University was organized on plans similar to those of London and Victoria universities, with Mason College as a nucleus. The university is governed by a chancellor, principal, and a court of governors consisting of the faculties or certain members thereof. Four faculties have been established, those of arts, science, medicine, and commerce, but degrees are also to be given in science and engineering. The aim in the establishment of this institution is to bring university work into more direct relations with industry and commerce. The university began work in the autumn of 1902 with the Rt. Hon. Joseph Chamberlain as chancellor.

SCOTCH UNIVERSITIES. These were mostly founded during the fifteenth century, and resemble the Continental, especially the German universities, more than they do the English. The mediæval character clung to them until 1858, when by statute the universities were reorganized. See SAINT ANDREWS; ABERDEEN; GLASGOW; EDINBURGH, UNIVERSITY OF.

IRISH UNIVERSITIES are those of Dublin and Queen's University, including Queen's College at Belfast, Cork, and Galway. Under DUBLIN, UNIVERSITY OF, and QUEEN'S COLLEGE will be found the information relating to these universities.

CANADIAN UNIVERSITIES are those of Montreal and Toronto. There are fourteen other institutions of degree-giving rank in Canada, mostly on denominational foundation, and twenty-four institutions of higher learning, usually termed colleges, that give no degrees.

AUSTRALIAN UNIVERSITIES exist at Sydney, at Melbourne, and at Adelaide. The first was founded in 1851 and is affiliated with the University of London. There are four faculties—arts, law, medicine, and science. While the university is non-denominational, there are statutory provisions for facilitating the erection of colleges in connection with different religious bodies, and such colleges representing the Episcopal, Presbyterian, and Roman Catholic Church have been established. In 1901 the student body numbered 657. The University of Melbourne was established and endowed by royal act in 1853. There are three affiliated colleges in connection with the Church of England, the Presbyterian and the Wesleyan churches; also an affiliated school of mines at Belfast. The student attendance in 1901 was 647. The University of Adelaide was incorporated in 1874 and has been endowed chiefly by private benefactions. Faculties are organized in arts, sciences, medicine, law, and music. The number of matriculated students in 1901 was 316.

The University of New Zealand was founded in 1871 and later empowered to confer degrees in the four faculties. In 1874, by union with the University of Otago (founded in 1869), the functions of the former institution are restricted to its giving examination and conferring degrees, while the latter became an affiliated college. A College of Mines was later established. The attendance in the constituent colleges at Dunedin, Christchurch, Auckland, Wellington, and Canterbury was 783 in 1901.

The Universities of India, with the dates of their establishment, are as follows: Calcutta, 1857; Bombay, 1857; Madras, 1857; Punjab, 1883; and Allahabad, for the Northwest Provinces (United Provinces of Agra), in 1887. For the most part the instruction is given in numerous affiliated colleges. Faculties in arts and philosophy, medicine, law science, and engineering exist. Instruction is usually given in English, though in the Oriental College of the Punjab University instruction is in the vernacular. The more than fifty colleges of the University of Punjab are affiliated with the University of Cambridge.

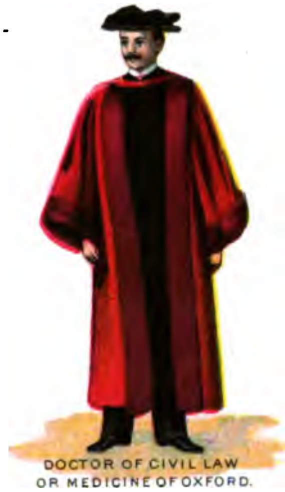
French Universities take their origin from the University of Paris, the first great university of Northern Europe. (See **Paris, University of.**) In the greater part of the nineteenth century the word university had a widely different meaning in France from that which it conveyed in other countries, the term 'Université de France' being nearly equivalent to 'national system of education of France.' The French Revolution put an end to the universities of the *ancien régime*, and the attempts of the Convention to establish similar institutions were short-lived. Napoleon organized a comprehensive system of higher education in one unified whole—the University of France. This was placed directly under the control of the Government, administered from Paris, and made an instrument of government in the hands of the central power. Higher education was given under fifteen faculties in each of the educational districts. These faculties were preëminently examining and degree-conferring bodies. The courses of study were strictly controlled from Paris, and the work was almost wholly of a professional and practical character. This organization, with various alterations, continued until 1896. While the various faculties of law, theology, medicine, science, and literature existed in most of the different educational districts, the so-called academies, in no case save at Paris were they organized into a university. The law of 1896, which went into effect January 1, 1898, created fifteen autonomous universities in place of the previous unified university with scattered faculties. While much of the control of the institution is still exercised by the Minister of Education and the authorities at Paris, yet much local autonomy is exercised in respect to examinations, degrees, and supplementary courses of instruction. The support of these institutions is now left largely to the localities. This stimulates local pride and activity, and many of the localities have made great additions to the material equipment and plant of the institution. Private munificence can now also be accepted, and it has been given in some instances. The universities in the smaller towns, however, have suffered considerably from the change, for while the change has largely increased the student attendance, yet this has been for the most part to the advantage of the universities in large cities, such as Paris, Bordeaux, and Lyons. The local universities are also under the necessity of supporting the course of study given outside of the State programme.

The reform of 1896 was quite as important in regard to methods of study as in regard to administration. New emphasis is laid upon the work of investigation. The professional student is now given an opportunity for doing this, and in some faculties is expected to do it previous to receiving a degree. The change has especially benefited the Faculty of Science and Arts, which previously had had no regular students, since all courses were public and free and were consequently attended chiefly by chance comers. The same reform provided for the opening of the universities to foreigners and the reëstablishment of the doctorate. The attendance of foreigners, especially Americans, has increased constantly since the reforms were instituted. The number of professorships has also been largely increased. The university system now includes two faculties of Protestant theology, thirteen faculties of law, seven faculties of medicine, fifteen faculties of science, fifteen faculties of letters, and four mixed faculties (Bordeaux, Lille, Lyons, Toulouse). The local universities in addition to the four just mentioned are Paris, Aix, Marseilles, Besançon, Caen, Clermont, Dijon, Montpellier, Nancy, Poitiers, and Rennes.

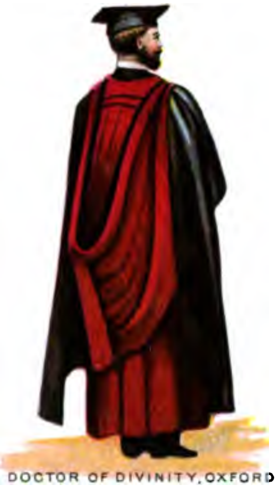
German, Austrian, and Swiss Universities. The early German universities were modeled after the University of Paris, though the University of Bologna had considerable influence on the universities of the South German States; and it is in the German universities that the general organization or structure of the mediæval universities is best preserved. Unlike the early universities of France and Italy, those of Germany were not of gradual growth, but were all created and chartered by both King and Pope and often by the Emperor as well. There were seven of these founded in the period to which all the early universities belong, that is, to the period previous to the Renaissance movement. The earliest of all was that of Prague, authorized by Pope Clement VI. in 1347, and by the Emperor Charles IV. in the following year. Then followed Vienna, in 1365; Heidelberg, in 1386; Cologne, in 1388; Erfurt, in 1393; Leipzig, in 1409; and Rostock, in 1419. It is only this group of German universities that incorporated the original organization into nations, and even in these the nations ceased to have any essential importance in the sixteenth century. Leipzig grew out of a secession of 5000 students and teachers from Prague, owing to hostility between the German and Bohemian students, and consequently the organization into nations was important, and continued to exist as a form until the nineteenth century. All these universities yet exist, save Cologne and Erfurt, which disappeared during the period of the French Revolution. The humanistic movement of the fifteenth and early sixteenth century produced nine new universities, four of which, Greifswald, Freiburg, Basel, and Tübingen, still exist. One of the others, Wittenberg (founded 1502), was the most influential of all during the later part of the sixteenth century.

The third period in the history of German universities is that of the Reformation and Counter-reformation, to the close of the seventeenth century. Twenty new foundations date from these two centuries, ten of them Protestant

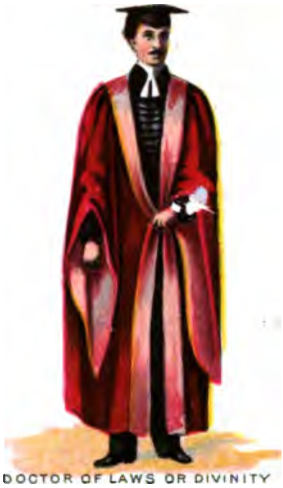
ACADEMIC GOWNS – BRITISH USAGE.



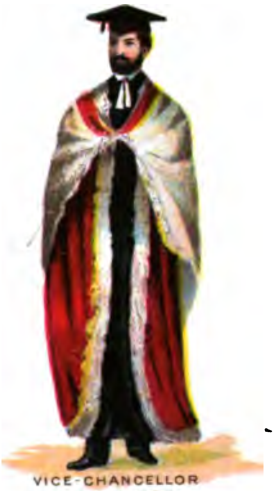
DOCTOR OF CIVIL LAW
OR MEDICINE OF OXFORD.
(FULL DRESS).



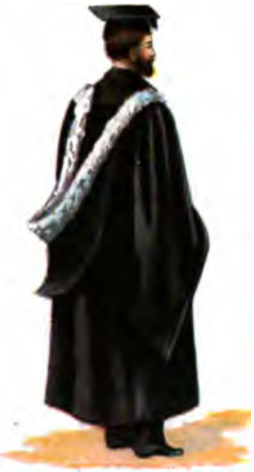
DOCTOR OF DIVINITY, OXFORD
(CONVOCATION ROBE).



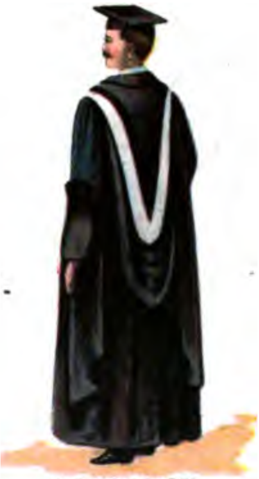
DOCTOR OF LAWS OR DIVINITY
CAMBRIDGE.



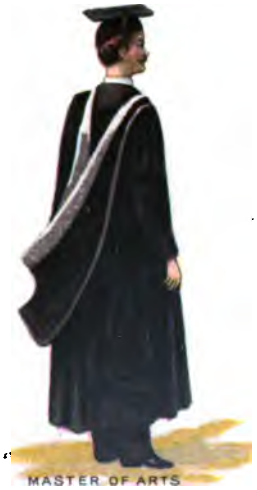
VICE-CHANCELLOR
CAMBRIDGE.



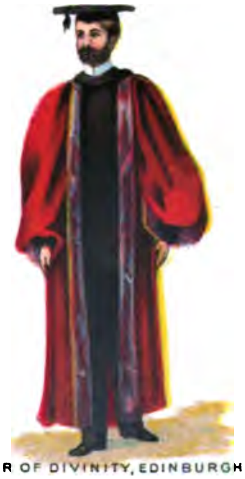
BACHELOR OF ARTS
OXFORD.



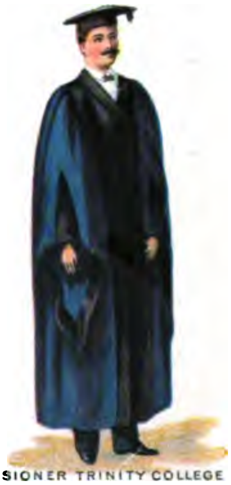
MASTER OF ARTS
CAMBRIDGE.



MASTER OF ARTS
EDINBURGH.



DOCTOR OF DIVINITY, EDINBURGH
(FULL DRESS).



PENSIONER TRINITY COLLEGE
CAMBRIDGE.

COPYRIGHT, 1903, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO. LITH N.Y.

ARRANGED BY GARDNER COTRELL LEONARD, B. A., INTERCOLLEGIATE BUREAU, ALBANY, N.Y.

and ten Roman Catholic. Half of each group has ceased to exist or continue merely as theological faculties under the control of the Church. These foundations were due for the most part to the territorial divisions caused by the religious dissensions, and throughout the period religious interest dominated all the universities, old and new. Consequently the influence, the spirit of the teaching, the manner of life was much more restricted during this period than in any other. The theological studies dominated. Toward the close of this period the universities of Germany sank to the lowest level of influence and importance, nor was the character of the work much higher. The court schools and circles of learning outshone the universities themselves.

The new era of the eighteenth century was ushered in by the foundation of Halle (1693) and Göttingen (1737). These two institutions marked the recovery from the stagnation of the seventeenth century. Halle was established in the interest of Lutheranism to combat some of the religious tendencies of the time, but soon outgrew the bounds originally set for it, especially under the influence of the famous Thomasius and Francke. Thomasius was the first to abandon the use of Latin for the German in the lecture room, and his example was soon followed to a greater or lesser extent throughout Germany. A further characteristic of this period was the dominance of the new rationalistic philosophy over the old scholasticism. The new philosophy recognized no bounds of authority, and the spirit of inquiry now came to be the dominant spirit of the universities. Instead of the merely formal study of the ancient classics, the various branches of philology were now recognized and pursued. The critical study of history also began. Halle and Göttingen dominate the eighteenth century and are recognized as the first universities of the modern type.

The present period, in which the scientific spirit of the nineteenth century is preëminent, opened after a period of upheaval consequent upon the Napoleonic wars. Nine of the old universities were suppressed and four combined with others. One of the measures adopted by the Prussian Government was the reformation of existing universities in the direction of greater freedom of thought, and the founding of the new University of Berlin in 1809. The influence of Berlin on other German universities has been paramount. Many antiquated and useless features have been abandoned and during the past century professorships in every branch of learning were established. The University of Bonn was founded in 1818 and has rapidly gained preëminence, especially in philosophy and philology.

At present the German universities are strictly State institutions and are subject to the 'Minister of Ecclesiastical, Educational, and Medical Affairs' of the respective States in which each is situated. Each, however, enjoys a high degree of autonomy and their constitutions are essentially republican. The internal administration of the university is in the hands of a rector, or, in case this title is borne by the sovereign, a prorector, a dean of each faculty, the senatus academicus, and the quæstor or treasurer. The discipline of the university over its students is maintained by means of a 'University Court,' composed of certain members of the faculty of law. The penalties inflicted are reprimands, fines, imprisonment in the University *Carcer*, deprivation of credit, suspension, and expulsion, the two latter holding good not only for the one but for all German universities. Aside from this the university exercises no control over its students, and there are, save in a few exceptional instances, no such institutions as colleges, halls, or dormitories. The term faculty signifies either (1) the teaching body, especially the full professors, or (2) the teachers and students in one of the great divisions of the university. At every German university there are faculties of law, medicine, philosophy, and either Protestant or Roman Catholic theology. In a few, such as Munich and Strassburg, an additional faculty in political science or in natural science has been organized. The teaching body of a German university consists of (1) full professors (*ordinarii, ordentliche Professoren*), (2) extraordinary professors (*ausserordentliche*), and (3) *Privatdocenten*. To these are to be added (4) readers (*lectoren*), appointed to give practical instruction in modern languages; there are also (5) masters of dancing, fencing, riding, etc., whose connection with the university is often merely nominal. The full professors are the occupants of chairs intended to be permanent foundations; they alone sit in the Senatus Academicus, and are alone eligible to the rectorship and deanships. The extraordinary professors are either younger men, to whom the professorial title has been granted by the Government for distinguished work, or they represent subjects in which no permanent chairs have been established; sometimes both conditions are exemplified in the same individual. The *Privatdocenten* are graduates who receive permission to lecture, but receive no official appointment and depend for their remuneration for the most part upon fees received from students. They are not subject to the authority of the professors, but from them are selected the *ausserordentliche Professoren.*

The only degrees given by the German universities at the present day are those of doctor and licentiate; the latter is given only in theology. The university degrees do not, as such, admit the recipient to the exercise of his profession in the Church, law, medicine, or the higher teaching service; for this, the passing of the State examination is necessary.

For a list of German, Austrian, and Swiss universities, see articles on the respective countries. The principal universities are described in separate articles.

ITALIAN UNIVERSITIES. During the Middle Ages the university movement had its origin and received its greatest impulse from Italy. The importance of Bologna in this respect has been discussed under the section on *Mediæval Universities.* Again, during the fifteenth and sixteenth centuries the Italian universities were the most important centres in all Europe of the new humanistic studies. While the new methods and subjects of study introduced by these Italian universities produced a complete academic revolution and paved the way for the Reformation, they possessed a fortunate immunity from dissensions like those which distracted the centres of learning in Northern Europe, especially Germany. The status of the professors in Italy was higher than in any other country. Nevertheless the universities suffered greatly from the general decline of the seventeenth and eighteenth centuries and did not recover with the early nineteenth, as did those of the Northern European countries. While they preserved their ancient organization and local independence, they suffered both from a great decrease of revenue and from the political disturbances of the Italian States. After the political unification of Italy in 1870 the Government nationalized the universities, by assuming their support and management and confiscating their property. Since that time the universities are included as a component part of the public system of education. There are seventeen of these State universities and four free universities—that is, supported by the local districts and municipalities. Consequently the opportunities for higher education are very much in excess of the needs of the population. Very few of these universities possess theological faculties, and the theological studies are little valued. Education for the Church is given in seminaries controlled by the Church and in its ecclesiastical character is most complete. The theological schools of Rome draw students from all quarters of the world, and in conjunction with them there is a system of national colleges for the students of the several countries. Faculties of philosophy do not exist in the free universities and are poorly attended in the State institutions. The faculties of medicine and of law possess an overwhelming preponderance of all students. The State universities are those of Bologna, Cagliari, Catania, Genoa, Macerata, Messina, Modena, Naples, Padua, Palermo, Parma, Pavia, Pisa, Rome, Sasseri, Siena, and Turin. The free universities are those of Camerino, Ferrara, Perugia, and Urbino.

Dutch and Belgian Universities. The universities of the Netherlands, which, like the later foundations of Germany, grew out of the Reformation struggles, were founded by the State for the especial purpose of training the clergy.

At the present time the Dutch universities are Leyden, Groningen, Utrecht, and Amsterdam, the last founded in 1877. These universities possess a uniform organization and are completely controlled by the State. The subjects of study and the examinations are determined by statute. Consequently there is little individuality among the universities and little to lead a student to prefer one institution to another. There are no colleges or halls, and no oversight of the students by the faculty. The Dutch universities are closely modeled after the German, but do not possess their flexibility. The character of student life, of methods of instruction, of conditions of examinations, of degrees conferred, closely approximate those of the German universities.

Belgium now has four universities, two of which, Liège and Ghent, are State universities similar to those of the Netherlands, while Louvain is controlled by the Roman Catholic Church, and Brussels is a free establishment.

Spanish and Portuguese Universities. There are at present nine universities in Spain, an additional law faculty at Oviedo, and a medical faculty at Cadiz. The universities are located at Barcelona, Granada, Madrid, Salamanca, Santiago, Seville, Valencia, Valladolid, and Saragossa. Each possesses two or more of the faculties of law, medicine, pharmacy, and science. Tuition charges are high and the universities depend almost wholly upon this source of revenue. For the most part the Spanish universities resemble in organization the French faculties previous to the reforms of 1896 and are not in a flourishing state. The largest is that of Madrid, with 95 professors and more than 5000 students in 1901. Portugal has one university, whose location in the early centuries of its existence alternated between Lisbon and Coimbra, but which is now at the latter place. There are faculties of theology, law, medicine, mathematics, philosophy, and a school of design. See Coimbra, University of.

Russian Universities are of two classes: those that are practically universities of the German type and date from the Reformation period, and those typically Russian. There are two of the former: Dorpat, founded in 1632 (see Yuriev, University of), and Helsingfors, in Finland, founded in 1640 by Queen Christina. The latter is a flourishing institution in the midst of a cultured people possessing a system of universal and compulsory education. Both the population which supports it and the institution itself are more closely allied to the Scandinavian countries than to Russia. The seven Russian universities are as follows: Moscow, founded in 1755; Saint Vladimir at Kiev, founded in 1832; Kazan, founded in 1804; Kharkov, founded in 1804; Warsaw, founded in 1816; Saint Petersburg, founded in 1819; Odessa, founded in 1865; and Tomsk, founded in 1888. In most of them the faculties are of history, science, jurisprudence, medicine, and languages. The attendance varies from about 5000 at Moscow to about 500 at Tomsk. In addition to the universities there are six theological schools and various medical and technical schools not represented in the university faculties.

Greece. No institutions of higher learning existed in Athens during modern times until after the liberation of the Greeks in the early part of the nineteenth century. In 1837 King Otho established the University of Athens, closely modeled after the universities of Germany. The four faculties of law, medicine, theology, and philosophy were created, with the power of appointment lodged with the King, who appointed mainly Germans. Since 1882 the right of nomination has been exercised by the faculties.

Scandinavian Universities. All State institutions since the Reformation have been strongly Lutheran in their character and are closely associated with the national Church. They were founded on the model of German universities and for the most part reproduce the present features of these. They are as follows: Upsala, in Sweden, founded in 1477; Copenhagen, in Denmark, founded in 1479; Lund, in Sweden, founded in 1666; and Christiania, in Norway, founded in 1811. The attendance varies from 2000 at Copenhagen to 650 at Lund. In addition to these universities there are in Sweden a State medical faculty at Stockholm, and private philosophical faculties at Stockholm and Göteborg.

American Universities. In the United States popular usage employs the terms 'university' and 'college' indiscriminately for any higher institution of learning which possesses the power of conferring the usual academic degrees. This confusion prevails also in official nomenclature, for some of the oldest, richest, and most completely equipped of our universities still bear the name of 'college,' while in certain parts of the country institutions inferior in endowment and in scholarly distinction to some of the secondary schools are officially designated as 'universities.' Harvard and Yale, though long since equipped with the amplest facilities for university work, have only very recently put aside the name of 'college,' and the same is true also of Columbia and Princeton.

Classified with reference to their pedagogic character, American universities may be roughly grouped under two general heads: (1) Universities that are equipped for the prosecution of original investigation and research in the various departments of study, besides usually having connected with them the various professional schools, representing the faculties of law, medicine, theology, and natural science; and (2) universities, so called, that perform chiefly the disciplinary and preparatory work similar to but somewhat more advanced than that of the German Gymnasium (q.v.). Institutions of the second class have a course more or less prescribed (see ELECTIVE COURSES AND STUDIES), leading to the degree of Bachelor of Arts, and in some cases to the alternative degrees of Bachelor of Science, Bachelor of Letters, or Bachelor of Philosophy. With the granting of such degrees the responsibility of the institution usually ends, though some of the universities offer facilities for advanced lines of study. But in all, the 'undergraduate courses' leading to the baccalaureate degree form the most important portion of the curriculum.

Of the former class, to which in the best usage the term university is now restricted, are Harvard, Yale, Columbia, Princeton, Michigan, Johns Hopkins, Clark, Pennsylvania, California, Chicago, Cornell, New York, and the Catholic University of America at Washington. The last is the only institution of all this class that does not now offer the preparatory collegiate work, but confines itself wholly to post-graduate instruction. However, in most of these less stress is laid upon the collegiate work than upon the more original work performed by those who have already received the first degree in arts and science, and who are consequently engaged in the special or professional investigations that are to fit them for their life's work. In the remainder of these, and in many similar institutions bearing the name university, the chief emphasis is upon the undergraduate work, though the advanced and progressive work is also represented and the title of university is appropriate. Such are the State universities of Virginia, California, Michigan, Indiana, Minnesota, and several other States, Boston University, and Princeton University. So far as the advanced work is carried in these institutions, it is in no wise inferior to that of institutions laying the chief stress on graduate investigation and instruction. In no case is there an institution comparable to the universities of Oxford and Cambridge, made up of constituent colleges doing undergraduate work; nor, on the other hand, universities in the German sense of the term. The one institution that confines itself wholly to graduate work is a denominational institution, and hence does not furnish a parallel, since it draws only from a restricted clientele.

The influence of the German universities, however, has been most instrumental in developing advanced instruction in American institutions. The first American to graduate at a German university was Edward Everett, who received his doctor's degree at Göttingen in 1817. During the next few years this example was imitated by four or five others, among them George Bancroft, who received his degree in 1820. Not until after 1840, however, were any great number of American students attracted to the German universities. From that time a constantly increasing number pursued such a course and returned to affect immediately the work of American institutions. As early as 1800 Harvard College had accepted resident graduates, and announced their names as students. A varying number, never over twelve, continued each year until 1860, when Harvard first definitely announced in its catalogue that such students would be accepted and provided for, and three years later announced a series of graduate courses.

Meanwhile Yale College had preceded Harvard in the development of graduate work. In 1847 a 'department of philosophy and arts' was organized for 'scientific and graduate study.' This department was expanded until in 1860-61 it was divided into (1) the Sheffield Scientific School and (2) the special courses in philology, history, philosophy, etc., and the announcement was made that the degree of Doctor of Philosophy would be conferred, as was done for the first time at the close of that year. In 1872 the graduate work was organized into a separate department, as the first distinct graduate school. In the same year Harvard announced that it would confer the advanced degree, but it was not until 1890 that a separate graduate school was organized. Other institutions, such as Columbia, Michigan, Cornell, and Princeton, soon followed the example of the older institutions in providing for advanced degrees and in the case of the Master's degree some even preceded the older institutions. In the case of Cornell University, opened in 1868, the graduate work and graduate degrees were planned from the beginning. The Johns Hopkins University, founded in 1876, has been the most influential of all factors in developing university work similar to that of the German universities. Here first was found an institution devoted chiefly to the training of advanced students; here first were found the opportunities for research along the line of all the social and natural sciences, literature, and philosophy; here first was the organization of work similar to that of German institutions and the same freedom and opportunity of wide choice given to the student. For many years the men trained at this university exerted the greatest influence toward the introduction of similar work in other institutions where the university work was developing out of the old collegiate work. A second great influence is that exerted by Harvard University during the incumbency of President Eliot. Nowhere else has the close and beneficial relationship that may exist between the graduate and undergraduate work been so demonstrated. A similar influence was exerted upon State universities, which for the most part are only colleges with non-graduate professional schools added, and by the graduate instruction both in natural and the social sciences by Cornell University, ample provisions for which were made at its foundation in 1868. More recently several other institutions have vied with these in the importance of their university work, notably two, which now lead all the others in graduate attendance, namely, Columbia University and the University of Chicago. Columbia as reorganized in 1890 provided for graduate work, in a graduate faculty of philosophy, of political science, and (in 1893) of pure science. Since then the faculty of medicine and the faculty of law have become graduate faculties, and the faculty of education (see TEACHERS COLLEGE) provides for a large number of graduate students. In numbers pursuing graduate studies this university now leads. The University of Chicago, founded in 1891, has laid the greater emphasis upon graduate work from the beginning, and has introduced a number of novel features, some imitations of features of English universities, some of German, and some original. Several of these, such as the continuous session, and the publication department, as an important phase of the university work, seem destined to come into general acceptance.

The degrees conferred by universities for advanced work are usually those of Master of Arts (A.M.) and Doctor of Philosophy (Ph.D.), though sometimes the Master of Science (M.S.) and the Doctor of Science (D.S.) are also given. The tendency now in both the graduate and undergraduate work of universities is toward giving a single degree (A.B., A.M., and Ph.D.) upon the completion of any one of a number of allied courses. The requirements for the Master's degree show considerable variation among the different institutions. The degree usually indicates one year of resident graduate work beyond the bachelor's degree, though it is still frequently given *honoris causa*. The minimum for the Doctor's degree is two years' work beyond the baccalaureate, including the preparation and usually the publication of a thesis. In most cases the doctorate requires three years of graduate work. In 1873 there were 43 doctorate degrees conferred, 25 of which were upon examination. By the close of the century this number had increased to from 300 to 350 each year, with less than five per cent. given *honoris causa*. The graduate students in twenty-five institutions number four thousand. See DEGREE.

Complete freedom of choice is naturally given to the student in the selection of his studies, as is now the usual, or at least the frequent custom in undergraduate studies. (See ELECTIVE COURSES AND STUDIES.) Consequently the A.B. degree as well as the Ph.D. does not indicate the mastery of any particular subject or subjects. The German custom of requiring the student to select a major and one or two minor subjects prevails in most universities, though Harvard and Yale simply require that the kind and amount of the work be satisfactory to the appropriate committee. The present tendency in other institutions is away from this division into majors and minors. The amount of time or number of courses included in a major or minor varies with the university. A major for a Doctor's degree ordinarily represents two courses of two or three or four hours weekly for two or three years, as the case may be. It is often more in amount. The minor is ordinarily one-half of the above requirement. The greatest variety of choice is offered the student for his selection of majors and minors.

The teaching staff is composed of professors, adjunct or associate professors, assistant professors, instructors, tutors, and assistants. The American professor is always a teacher, and the amount of his time that must be devoted to actual lecturing and teaching is usually prescribed for him by the college regulations; it is ordinarily from eight to twelve hours per week. He has not the privilege accorded to the German professor, of 'reading' or not, but must every year go through a certain number of courses of instruction, besides being expected, in many of the colleges, to assume a certain amount of responsibility for the morals and discipline of the undergraduates. This is a very serious obstacle in the way of his ability to carry on independent investigation and research, and makes the American professoriate a comparatively sterile body, though an improvement in this respect has been very noticeable in the past few years. The university instructor is now expected to be not only a director of investigation and an investigator himself, but he is also expected to publish the results of his investigations. The same kind of work is also coming in increased amount from the colleges, though there the instructor must spend the greater part of his time (from 15 to 20 hours per week) in class instruction. Harvard, Yale, Chicago, Cornell, Columbia, the Johns Hopkins, Clark, and other universities have now largely adopted the German conception of the professorial function, and allow the individual professor much greater liberty in the discharge of his duties than was formerly the case. Harvard, Columbia, Yale, Chicago, and Cornell have likewise adopted the laudable plan of allowing each professor one year's leave of absence in seven, though with some diminution of salary.

In organization the universities differ considerably, especially as to detail and local arrangements. In general the organization is into faculties of philosophy, pure science, applied science, medicine, law, etc., presided over by deans, who are administrative rather than educational heads; the faculties are divided into departments, of Greek, mathematics, etc., presided over by a head professor, who usually exercises a general control over the work of the department. To him the associate professors, tutors, etc., in the department are responsible. He arranges the subjects of study, assigns the work of the subordinate instructors, and reports to the president or chancellor from time to time upon the work accomplished. In other universities the departmental organization is wholly democratic, in which the only headship is the formal one of seniority. The president (or chancellor) exercises a general supervision over the entire institution, and is the medium of communication between the faculty or faculties and the 'trustees,' 'overseers,' 'regents,' or 'governors' of the university—a body with whom usually rests the ultimate sovereignty of the institution, and who have exclusive control of the finances. These men are generally a body with the right of coöptation; but in some institutions, as in Harvard and Dartmouth, the graduates elect a certain proportion of their number. In some of the State universities, as, for instance, the University of Michigan, the regents are elected by popular vote, and in others are appointed by the Governor, and in both cases the office has a semi-political significance. The right of interference with the internal concerns of the university is not always actively exercised.

The organization of the professors and instructors in American universities differs widely. In the institutions where most of the work is in arts and science there is generally a single faculty. In the larger universities the faculties are often wholly distinct, the president acting as the only bond between them. Each faculty, then, legislates independently of the others on matters affecting its own local interests, while questions affecting the university as a whole are left largely to the board of trustees, advised by the president and sometimes by the faculties.

From what has been said concerning the relation of colleges and universities, it will be readily seen that it is impossible to give any statistics covering all university work in the United States. There are few colleges that do not undertake the direction of the work of a graduate student for a year; and, on the other hand, there are very few institutions that devote even their major energies to advanced work. There is no institution comparable to the German university. While the line between graduate and undergraduate work is distinct, there are no such demarcations of institutions. The United States Commissioner of Education in his report for 1901 gives statistics for 647 universities, colleges, and technical schools of degree-giving rank. Four hundred and seventy-three of these are colleges and universities for men or for both sexes; of these 336 are open to both men and women, and 137 admit men only to the undergraduate department. The total attendance in these institutions for the year 1900-01 was 103,351; of these 75,472 were men and 27,879 were women. This is an increase of 68 per cent. for men and 159 per cent. for women during the decade. These institutions conferred degrees upon 11,463 men and 5050 women completing the course of study during that year. The number of professors and instructors in these institutions was 23,041; of this number 14,900 were in the 473 colleges and universities of the first group. The total value of the property possessed by the 473 colleges and universities was $391,230,784; of this sum $177,000,000 was in permanent endowment. One hundred and sixty-four of these institutions had no endowment, while thirty possessed more than one million each. The total income of the 473 institutions for the year was $33,359,612, and the benefactions $18,040,413.

BIBLIOGRAPHY. *Ancient Universities:* Capes, *University Life at Ancient Athens* (London, 1877); Mahaffy, *Old Greek Education* (New York, 1882); id., *The Greek World Under Roman Sway* (ib., 1890); Monroe, *Source-Book On the History of Education for the Greek and Roman Period* (ib., 1901). *Mediæval Universities:* The most recent and best reference book is Rashdall, *The Universities of Europe During the Middle Ages* (Oxford, 1895). Consult also Denifle, *Die Universitäten des Mittelalters bis 1400* (Berlin, 1885); Paulsen, *Geschichte des gelehrten Unterrichts* (Leipzig, 1896-97); Raumer, *Geschichte der Pädagogik* (Gütersloh, 1882); Zarncke, *Die deutschen Universitäten im Mittelalter* (Leipzig, 1857). More popular and briefer sketches of the entire subject are Compayré, *Abélard and the Origin and Early History of Universities* (New York, 1895); Laurie, *Rise and Early Constitution of Universities* (ib., 1895). A good bibliography is given in Cubberly, *Syllabus on the History of Education* (New York, 1902). For the German universities in particular, Paulsen, as above; Kaufmann, *Geschichte der deutschen Universitäten* (Stuttgart, 1888-96); Döllinger, *Die Universitäten sonst und jetzt* (Munich, 1871); Sybel, *Die deutschen Universitäten* (Bonn, 1874); Conrad, *The German Universities for the Last Fifty Years* (Eng. trans., with introduction by James Bryce, Glasgow, 1885). Yearly statements of lectures with information are given in Acherson, *Deutscher Universitäts-Kalender* (Berlin), and the *Deutsches Akademisches Jahrbuch* (Leipzig). For American treatment, Burgess, *The American University* (Boston, 1894); Butler, *The Meaning of Education* (New York, 1898); Eliot, *Educational Reform* (ib., 1898); Ladd, *Essays on Higher Education* (ib., 1899); Thwing, *The American Colleges and American Life* (ib., 1897); id., *American Colleges* (ib., 1883); Butler, *Education in the United States* (Albany, 1900); United States Bureau of Education, *Contributions to American Educational History* (36 vols.); Gilman, *University Problems* (New York, 1898); annual statistics are given in Trübner, *Minerva. Jahrbuch der gelehrten Welt* (Strassburg).

UNIVERSITY CLUB, THE. A social organization in New York City, incorporated in 1865. The qualification for membership is the holding of a college or university degree involving a three years' course of study, or an honorary degree from a university or college, if the holder is distinguished in literature, art, or the public service. Graduates of West Point and Annapolis are eligible for membership also. The number of members is limited to 2000 resident and 1500 non-resident and army and navy members. The total membership in March, 1903, was 3278. The library contains about 20,000 volumes.

UNIVERSITY EXTENSION. A system of higher education designed to meet the needs of men and women who are unable to attend higher institutions of learning. University extension work was begun by the University of Cambridge, England, in 1872-73, when, largely owing to the zeal of Professor James Stuart, it offered to supply the towns of England with capable instructors in the various departments of knowledge, under the supervision of the university. The administration of this work was vested in a syndicate instituted in 1873. In 1876 university men in London founded the London Society for the Extension of University Teaching, which was, in 1902, made a department of the University of London. In 1885 the University of Oxford instituted its 'Delegacy for the Extension of Teaching Beyond the Limits of the University.' This action was the result of the success attained by several of the Oxford colleges in the establishment of 'Extension Colleges' at Reading and other English towns. At the present time every university in England is engaged in extension work.

University extension teaching has been introduced, sometimes in a modified form, and successfully carried on in the United States, Germany, France, Belgium, Austria, Denmark, Scandinavia, Russia, Australia, and Canada. In a few instances, notably in the State of New York and in Vienna, the enterprise has received Government aid. But in general it has been supported by the fees of the students, assisted by college grants or private subscriptions.

The subject of university extension was first publicly presented in the United States at a meeting of the American Library Association during their session in the Thousand Islands in September, 1887. The English system, as adapted to American local needs, was promptly taken up by librarians in Buffalo, Chicago, and Saint Louis. In these and many other cities the idea was gradually developed and extended by the cooperation of university graduates with libraries, churches, and other local institutions. In January, 1888, Melvil Dewey, then chief librarian of Columbia University, laid the plan before the regents of the University of the State of New York, and at the University convocation in Albany, July, 1888, advocated university extension in connection with public libraries. In February, 1890, a committee of New York colleges and universities urged the regents to establish, under State supervision, a system of extension teaching. On May 1, 1891, a bill was signed by the Governor of New York appropriating $10,000 for the State organization of university extension. No part of the grant could be used for the payment of lecturers, but only for purposes of organization, supervision, and printing. This grant of $10,000 is the first case on record of a State appropriation for university extension.

In 1890 a few public-spirited citizens of Philadelphia founded the American Society for the Extension of University Teaching. In 1891 followed the Albany movement mentioned above; and upon its opening in 1892, the University of Chicago established an extension division as one of the main departments of its work. Mainly from these three centres university extension in the United States has been carried on, though other educational institutions in various parts of the country have done similar work. Some of the more notable of these are: Johns Hopkins, Brown, Stetson (Fla.), and Northwestern universities; the universities of Wisconsin, Indiana, Iowa, Wyoming, Kansas, Colorado, and California; Colby College (Me.); Rutgers College (N. J.); Lowell Institute, Boston; Brooklyn Institute; People's Institute (N. Y.), etc. Teachers College, Columbia University, has also conducted extension classes, and in 1903 Columbia University instituted an extension department, the administration of which is vested in Teachers College. Mention should be made of the system of 'free lectures to the people' of the New York Board of Education, embodying most of the features of university extension work.

As a system of instruction, university extension involves the following elements:

The Course of Lectures. The lectures must be given by one instructor, usually at weekly or fortnightly intervals. The lectures in a course must be correlated, dealing with a particular epoch of history, or author, or school of literature, or section of a department of science, etc. They must be scholarly, as representing the thought of the universities; they must be popular to attract and hold the auditors. The number of lectures in a course varies with different organizations. The unit adopted by Oxford, by the American Society, and by Chicago is the six-lecture course. Cambridge has a twelve-lecture unit; and Columbia a six-lecture unit for its more popular courses, and a thirty-lecture unit for its academic and professional courses. The lectures are frequently illustrated by stereopticon, or by demonstrations.

The Class. By 'class' is meant the group of people of the audience who remain after the lecture for questions, discussion, and suggestions on the subject of the lecture. Individuals, also, may here get personal advice on their work and reading, and criticism of their essays.

The Students' Association. This is a club of students and readers desirous of getting the stimulus that working in common affords. The Students' Association has its own organization, and its regular programme of work, both before and after, as well as during the lecture course.

The Syllabus. Systematic guidance in every lecture course is provided in a special syllabus, outlining each lecture, selecting the best books on the subject, offering topics for thought, reading and papers, and illustrative notes, and prescribing the work required for certificates.

Traveling Libraries. To facilitate the student work in places not provided with adequate library facilities, the central organization usually provides a select library of perhaps fifty volumes of books recommended by the lecturer.

The Examination. At the close of each course of lectures a written examination is given by the lecturer to those auditors qualified and willing to take it. The qualification may be the reading of certain books, the presentation of a certain number of essays during the course, regular attendance, etc. The certificates obtained by successful candidates in these examinations are sometimes valuable in special ways. For example, in England they are credited toward the Government requirements for pupil-teachers' standing. In Chicago they count toward the baccalaureate degree of the university. In Columbia the thirty-lecture courses receive the same credit as the corresponding courses within the university.

Local Centre. University extension is based on the principle of local initiative. It requires that those who desire to avail themselves of its assistance shall be organized as a centre. By 'local centre' is meant a group of people who are willing to adopt extension aims and methods, arranging through a local committee on the one hand and the central organization on the other for systematic courses of extension lectures.

Cambridge in 1901-02 gave 85 courses, with an attendance of about 16,000; London, 1901-02, 195 courses, with an attendance of 15,500; Oxford, 1901-02, 190 courses, with an attendance of 21,000; the American Society, 1902-03, 98 courses, with an attendance of 26,000; Chicago, 1902-03, 208 courses, with an attendance of 43,500; and the New York Board of Education, 1902-03, 4200 lectures, some given in courses, with a total attendance of 1,250,000.

Consult: Adams, in *Reports* of the United States Commissioner of Education, (a) 1898-

99, chap. xviii., "University Extension in Great Britain;" (b) 1899-1900, chap. v., "Educational Extension in the United States." In the latter article will be found select bibliographies of all branches of the subject.

UNIVERSITY SETTLEMENTS. See Social Settlements.

UNNA, ṳn'nȧ. A town in the District of Arnsberg, Prussia, thirty miles south of Münster (Map: Germany, B 3). The town has important iron industries. In the vicinity is the great salt mine of Königsborn. Population, in 1895, 12,355; in 1900, 14,918.

UNNATURAL COMBAT, The. A tragedy by Philip Massinger, produced at the Globe in 1619 and printed in 1639. It is a characteristic but hardly pleasing work, with fine bursts of rhetoric. The combat is a duel between a father who has poisoned his first wife in order to marry another and his son, who challenges his father and is killed by him.

UNST, ŭnst. The northernmost of the Shetland Islands (q.v.).

UNTER DEN LINDEN, o͞on'tẽr dȧn lĭn'den. A famous avenue of Berlin, named from the rows of linden trees with which it is planted. It extends from the Brandenburg gate to the palace of Emperor William I., and is extended thence to the Royal Palace by the Platz am Opernhaus, Platz am Zeughaus, and the Lustgarten, a total length of about a mile. The street is 196 feet broad and is flanked by the finest shops, the university, arsenal, and several palaces.

UNTERWALDEN, o͞on'tẽr-väl'den. A canton of Switzerland, bounded by the Canton of Lucerne and the Lake of Lucerne on the north, the Canton of Uri on the east, Bern on the south, and Lucerne on the west (Map: Switzerland, C 2). It is divided into the two half cantons of Nidwalden (112 square miles) and Obwalden (183 square miles), of which the former forms a part of the Engelberg Valley and slopes toward Lake Lucerne; the latter is more elevated, belonging to the region of the Bernese and the Lucerne Alps. The principal river is the Aa. Stock-raising and gardening are the leading industries, and dairy products and fruit are the main exports. The two half cantons have separate governments, and are among the most democratic cantons in Switzerland, the legislative power being exercised directly by the people assembled in the Landsgemeinde. The initiative is in force. The canton sends two members to the National Council. The capital of Obwalden is Sarnen, and of Nidwalden, Stanz. Population, in 1900, Obwalden, 15,270; Nidwalden, 13,017. The inhabitants are mostly German-speaking Catholics.

Unterwalden originally belonged to Aargau and Zürichgau. It came under the rule of the Hapsburgs, took part in the uprising against them, and in 1291 concluded an alliance with Uri and Schwyz, which formed the nucleus of the Swiss Confederation. It took part in the formation of the League of Sarnen (1832) and the Sonderbund (1843).

UN'WIN, William Cawthorne (1838—). An English engineer, born at Essex. He was a student under Sir William Fairbairn, and from 1868 to 1872 was instructor at the Royal School of Naval Architecture. In 1872 he was made professor of mechanical and hydraulic engineering at the Royal Indian Engineering College, and in 1884 professor of engineering at the Central Technical College of the Guilds of London. His publications include: *Wrought Iron Bridges and Roofs* (1869); *The Testing of Materials of Construction* (1888); *Development of the Experimental Study of Steam Engines* (1895); and *The Life of Hirn* (Watt Lecture, 1896).

UNYORO, ŭn-yō'rô. A native kingdom of Central Africa, northwest of the Kingdom of Uganda, between lakes Albert and Ibrahim, and constituting a part of the Western Province of the Uganda Protectorate (Map: Congo Free State, F 2). Estimated area, 32,000 square miles; population unknown. In the south the country is hilly and in the north level and heavily wooded. The inhabitants are the Wanyoro, an agricultural Bantu tribe, whose language has extended to other territories. Under British protection the country has made commendable progress. See Uganda Protectorate.

UPANISHAD, o͞o'pȧ-nē-shäd' (Skt. *upaniṣad*, a sitting down beside, session, esoteric doctrine). The name of a class of Vedic works devoted to theological and philosophical speculations on the nature of the world and man. In the Vedic literature the Upanishads are closely related with the Aranyakas, being either imbedded in them or forming their concluding chapters. Both Aranyakas and Upanishads are found generally at the end of the Brahmanas, or, as in the *Iśā-Upanishad*, even at the end of a Samhita. (See Veda.) They mark, therefore, a course of advanced knowledge consciously regarded as subsequent and superior to the primary ritual instruction which is the ordinary theme of the Veda. Hence the Upanishads are also called *vēdānta*, 'end of the Veda,' a term which is later interpreted to mean 'final goal of the Veda.' (See Vedanta.) All Hindu speculation presupposes the theory of transmigration of souls. In the oldest Vedic period the Hindu people took a joyous view of future life. At a somewhat later period, however, the Hindus acquired, probably from popular channels, the firm belief in *Karma* (q.v.), which appears first in the Satapatha Brahmana, and has since remained an axiom of Hindu thought which requires no proof, doubted by none except by materialistic atheists. The theory of transmigration is coupled in the Upanishads with the equally important theory of the world-soul and its presence in all living or organic beings (pantheism). The human body is supposed to be pervaded by breaths, *ātman*. These vivify the body and are the essential part, the ego, the individual existence. The *ātmans*, or breaths, are conceived as flowing from a single *ātman*, the universal ego. All the worlds are merely an emanation of this great universal ego; the *ātman* is the all. The notion of the *ātman* is further coupled with that of the *brahma*, 'the sacred word.' (See Brahma.) The two ideas, in time, are fused so that in the composite *ātman-brahma* we have two manifestations of the final all-power. Here the *ātman* represents, as it were, the physical aspect, while the *brahma* stands for the spiritual side of universal life and the ultimate essence. The fundamental doctrine of the Upanishads is the identity of the individual soul (*ātman*) with the world-soul (*ātman-brahma*). The formula 'that art thou' (*tat tvam asi*) is the key-note of all Upanishad teaching. It is a curious fact that this doctrine is coupled with the pessimistic belief in transmigration. Instead of rejoicing in the knowledge of their own divine essence, the Hindus look upon their individual existence as a condition of separation from the divine essence. The wandering of the soul through the realms of death is the consequence of its separation from the *brahma*, and the Hindu salvation, the escape from the chain of successive deaths, can be attained only by reunion with the *brahma*. The Hindus never had any theory as to how the individual souls were separated from the all-soul; they took this for granted. Desire, or clinging to life, is the reason why this separation, with its attendant succession of deaths, continues. The only cure for desire is knowledge, or, perhaps better, recognition of the unity of the ego with Brahma and the ever present recognition of the divided condition of everything finite. Thus the ultimate attainment for man is this recognition, which is salvation through the penetrating knowledge of one's own divine nature, which effaces the entire delusion of individual existence.

The date of the Upanishads, like that of the Vedic writings, is quite uncertain, but the earliest of them can hardly be dated later than B.C. 600, since their most important ideas appear in an advanced and somewhat decayed state in the Buddhist writings. The older Upanishads are the products of Vedic schools. The two most important, the *Bṛhadāraṇyaka* and the *Chāndōgya*, belong respectively to the White Yajur Veda and the Sama-Veda; the *Aĭtarēya*, *Kaŭṣitaki*, *Taĭttirīya*, *Kaṭhaka*, and *Maĭtṛāyaṇīya* or *Mānava* belong to schools of the same names. The *Kēna* and *Talavakāra* Upanishads also belong to the Sama-Veda, the *Iśa* to the White Yajur Veda, the *Śvētāśvētara* and the *Mahānārāyaṇa* to the Black Yajur Veda. A large and indefinite number of Upanishads, of which the *Muṇḍaka*, *Praśna*, and *Māṇḍūkēya* are the most important, are counted as belonging to the Atharva-Veda. The most authoritative list counts twenty-seven, but later Upanishads are generally counted as belonging to the Atharvan. A complete list of Upanishads is impossible, because the term Upanishad does not represent a closed canon, but rather an indefinitely extensible type of literature which has not been formally concluded, and which may be continued in the present or future. In 1876 235 Upanishads were enumerated, including apocrypha, one of those actually a Mohammedan treatise called *Alla Upaniṣad*. The later Upanishads may be divided into five classes: (1) Pure Vedanta Upanishads, which combine the Vedanta doctrines of the older texts without undue development of the notions of *Yōga* (concentration and abstraction from all mundane matters) or Samnyāsa (asceticism); (2) Yoga Upanishads, which presuppose the Vedanta ideas, and in addition advise mental concentration upon the sacred syllable *ōm* (q.v.); (3) Samnyāsa Upanishads, which recommend and describe a life of asceticism as the practical way of attaining the purpose of the Upanishads; (4) Siva Upanishads, which interpret the popular god Siva (q.v.) as a personification of the *ātman;* (5) Vishnu Upanishads, which interpret Vishnu (q.v.), or one of his avatars (see AVATAR), as divine or human manifestations of the *ātman*.

BIBLIOGRAPHY. Editions of individual Upanishads are extremely numerous in India. A select list is given by Macdonell, *History of Sanskrit Literature* (London, 1900). A convenient edition of 108 Upanishads was edited by Tukaram Tatya (Bombay, 1895). The older Upanishads were translated into English by Max Müller, *Sacred Books of the East*, vols. i., xv. (2d ed., Oxford, 1900). A more scholarly translation is given by Deussen, *Sechzig Upanishads des Veda* (Leipzig, 1897), who also published the standard discussion of their philosophy, *Die Philosophie der Upanishads* (ib., 1899), superseding the work of Gough, *The Philosophy of the Upanishads* (London, 1882). A valuable aid to the study of these texts is Jacob, *Concordance to the Principal Upanishads and Bhagavadgîtâ* (Bombay, 1891).

UPAS (Malay *ūpas*, poison), *Antiaris toxicaria.* A tree of the Philippine Islands of the natural order Moraceæ, to which also belong the breadfruit, mulberry, etc. The fruit is a kind of drupe, covered with fleshy scales. The Malays mix the milky juice of this tree with black pepper and the root juices of galenga and ginger for tipping their arrows. The fibre of the bark is sometimes made into cloth, but unless it is thoroughly cleaned garments made of it are said to produce itching. Some botanists believe that the tree whose bark is used for fibre is a distinct species, as other species of this genus are innocuous. The story of a poison-vale in Java, in which the exhalations of numerous poison trees destroy all animal life, and even all other vegetable life, is a mere fable.

UPAS TREE

UP'COTT, WILLIAM (1779-1845). A famous English collector of autographs. He was a natural son of Ozias Humphry, one of the greatest English miniaturists, by the daughter of an Oxford shopkeeper. He was brought up to the book trade; and when Richard Porson (q.v.), the celebrated Greek scholar, was appointed librarian in the London Institution Upcott became his assistant (1806). He resigned in 1834, and passed the rest of his life at Islington. At his home, known as 'Autograph Cottage,' he collected over 32,000 letters illustrated by 3000 portraits. After his death these and other valuable manuscripts were sold, and many of them have found their way into the British Museum. Upcott published a *Bibliographical Account of* *the Principal Works Relating to English Topography* (3 vols., 1818); revised for the press *Evelyn's Diary* (1818); edited Evelyn's *Miscellaneous Writings* (1825); and engaged in much other antiquarian work.

UPERNIVIK, o͞o-pĕr′nĭ-vĭk, or **UPERNAVIK**. The most northern Danish district in Greenland, on Baffin Bay. The town Upernivik, with a mission station, is on a small island just off the coast in latitude 72° 48′ N., and longitude 55° 54′ W. (Map: Arctic Regions, G 6). The mean temperature here is 5.8° in January and 40.5° in July.

UPHAM, ŭp′am, Charles Wentworth (1802-75). A Unitarian clergyman. He was born at Saint John, N. B.; graduated at Harvard College, 1821, and at the divinity school, 1824; was ordained colleague pastor with the Rev. John Prince of the First Unitarian Church, Salem, Mass., the same year, and remained there until he was compelled to leave the ministry on account of loss of voice in 1844. He edited the *Christian Review* and *Christian Register;* was Mayor of Salem, 1852; several times member of the Legislature; president of State Senate, 1857-58; member of Congress 1853-55. He published Letters on the *Logos* (1828); *Lectures on Witchcraft, Comprising a History of the Salem Delusion, 1692* (1831, enlarged ed. 1867); *Salem Witchcraft and Cotton Mather, a Reply* (1870), and *Lives* of Sir Henry Vane (1835), J. C. Frémont (1856), Francis Peabody (1869), and Timothy Pickering (1867-72).

UPHAM, Thomas Cogswell (1799-1872). A Congregational theologian. He was born at Deerfield, N. H.; graduated at Dartmouth College, 1818, and at Andover Theological Seminary, 1821. He was assistant teacher of Hebrew at the latter place, 1821-22; colleague pastor of the Congregational Church, Rochester, N. H., 1823-24; professor of mental and moral philosophy, and instructor in Hebrew, Bowdoin College, 1825-67. He published a philosophical series: *Elements of Intellectual Philosophy* (1827); *Elements of Mental Philosophy* (1831); *Treatise on the Will* (1834); *Outlines of Disordered and Imperfect Mental Action* (1840); *Lives of the French Mystics, Madame Guyon and Fénelon* (1847), and *Madame Catharine Adorna* (1856); *The Life of Faith* (1848); *A Treatise on the Divine Union* (1851); *Christ in the Soul* (1872).

UPHAM, Warren (1850—). An American geologist and librarian, born in Amherst, N. H. He graduated at Dartmouth in 1871, was employed on the Geological Survey of New Hampshire from 1870 to 1878, and on the United States Geological Survey from 1885 to 1895. In 1895 he became librarian of the Minnesota Historical Society, Saint Paul. He wrote: *The Upper Beaches and Deltas of the Glacial Lake Agassiz* (1887); *The Glacial Lake Agassiz* (1895); and *Greenland Icefields and Life in the North Atlantic, with a New Discussion of the Causes of the Ice Age*, with Professor A. F. Wright (1896).

UPHUES, o͝o′fo͞o-âz, Joseph (1850—). A German sculptor, born at Sassenberg, Westphalia. He studied for three years at the Berlin Academy, and became a follower of Begas, whom he afterwards assisted in his workshop. Much severer treatment of form, however, than is characteristic of Begas distinguishes his work, as may be seen in his "Sabine Defending His Sister," and the "Bowman" (great gold medal, Melbourne, 1888; Chicago, 1893), in the National Gallery at Sydney. For Düren in Rhenish Prussia he executed a Monument to Emperor William I. and the Bismarck Monument (1892); for Homburg and Wiesbaden (1896), Monuments to Emperor Frederick; and in Berlin he created an entirely novel type of a youthful "Frederick the Great;" and contributed to the monuments in the Siegesallee the statue of Margrave Otto II. Three large sepulchral monuments of his design at Düren exhibit deep religious feeling and noble conception.

UP'JOHN, Richard (1802-78). An American architect, born in Shaftesbury, England. He emigrated to the United States in 1829, and in 1839 he settled in New York, where his best work was done. His principal works are the cathedral at Bangor, Me., Christ Church and the Church of the Pilgrims in Brooklyn; and in New York, Trinity Church, the Trinity Building, Grace Church and Saint Thomas's Church, the Corn Exchange Bank, besides numerous private residences. From 1857 to 1876 he was president of the American Institute of Architects.

UPLAND PLOVER. A sportsman's name for the large sandpiper (*Bartramia longicauda*) common throughout the United States, and frequenting uplands and plains more than is customary with other species of its kind. See Sandpiper.

UPMARK, ụp′märk, Gustaf Heinrich Vilhelm (1844—). A Swedish art-historian, born at Stockholm. After studying at Upsala from 1861 to 1869, he secured a position in the National Museum at Stockholm and was appointed its director in 1880. He is the founder and chairman of the "Gripsholms Society" which, in 1889-95, restored the long-neglected ancient castle of the Vasa dynasty. Upmark's more important publications include: *De grafiska konsterna* (1889); *Svenska Riddarhuset, byggnadshistoria* (1891); *Die Architektur der Renaissance in Schweden* 1530-1760 (1897 et seq.); besides many essays concerning art in Sweden under the Vasa dynasty, such as *Tapetväfveriet i Sverige under de första Vasakonungarna* (1886), *Gripsholms slott* (1887), *Vadstena slott* (1892), *Skånska herrgårdar under renässanstiden* (1894), *Stockholms slott under Vasatiden* (1896), and others.

UPOLU, o͝o′pô-lo͞o. The second largest island of the Samoan group, situated just southeast of Savaii (Map: Australasia, L 4). It belongs to Germany. Length, 40 miles; extreme width, 15 miles; area, including adjacent islands, 340 square miles. It is the most fertile and attractive island of the archipelago. The coasts are fringed with coral reefs. The western part, the productive region, contains the volcano of Tafua (3100 feet). A mountain range extends east and west throughout the island. The northern slope is long and gentle and covered with forests. Apia is the capital; Falealili, the largest town. Vessels with 55,000 tonnage entered at Apia in 1901. Population, in 1900, 18,341. See Samoan Islands.

UPPER AUSTRIA, or AUSTRIA ABOVE THE ENNS. An archduchy and crownland, occupying the western part of the original Archduchy of Austria—the nucleus of the Austrian Empire. It is bounded on the north by Bavaria and Bohemia, on the east by Lower Austria, on the south by Styria and Salzburg, on the west by Bavaria, from which it is separated by the Inn and its tributary, the Salzach (Map: Austria, D 2). Area, 4631 square miles.

Almost all the archduchy is either mountainous or rolling. The Danube divides the land into two very unequal parts. The northern and smaller belongs to the primitive formation of the Böhmer Wald system, while the southern belongs to the Alps (Kalkalpen) system, where high peaks, with glaciers on their slopes, lift their heads. The highest point in the archduchy is approximately 10,000 feet—the Dachstein, on the extreme southern border. In the mountainous southwestern portion is the famous Salzkammergut (q.v.), from which the Traun Valley descends southeasterly to below Linz, through the heart of the archduchy. In the western portion is the Hausruck region, which produces brown coal in abundance. The Enns, an affluent of the Danube, entering near the southeast corner of the archduchy, marks the eastern boundary. Upper Austria is well watered. The Kammersee and Traunsee are the largest of its lakes. There are about thirty mineral springs, the best known being the saline waters at Ischl and the iodine waters at Hall. The climate is moderate and bracing.

The archduchy is highly productive. Over one-third of the total area is tilled, over one-third is in forests and nearly one-fifth meadows. Barley, oats, wheat, vegetables, fruit, and wine are the most prominent productions. Cattle and horse-raising are very important industries. Brown coal and salt are extensively mined, and there are valuable quarries of gypsum and stone. Copper is found in the north. The salt industry is a Government monopoly and about 30 per cent. of the product of the Empire is supplied by Upper Austria. The archduchy manufactures metal wares—weapons, knives, etc.—machinery, linens, cottons, paper, and cellulose.

The Landtag has 50 members, including the Bishop of Linz, 10 representatives from large landed estates, 17 from cities, 19 from rural communities, and 3 from the chambers of industry and commerce in the capital, Linz, the leading town. To the Lower House of Austria the crownland sends 20 delegates, all German. Population, in 1900, 810,246, mostly German Catholics.

UPPER SANDUS′KY. The county-seat of Wyandot County, Ohio, 60 miles north by west of Columbus; on the Sandusky River, and on the Pennsylvania and Hocking Valley railroads (Map: Ohio, D 4). It has an old mission church, a handsome court house, and a park. Upper Sandusky is chiefly engaged in manufacturing, the most important products being agricultural implements, hay presses, buggies, and other vehicles, caskets and burial cases, steam-presses, and tools. Population, in 1890, 3572; in 1900, 3,355.

UPPER TUNGUSKA, tụn-gōō′skȧ. See ANGARA.

UPSALA, ụp-sä′lȧ. The capital of the Län of Upsala, Sweden, on both banks of the navigable Fyris, in a fertile and historic plain, 41 miles by rail north-northwest of Stockholm (Map: Sweden, G 7). The ancient city is best known now for its university. (See UPSALA, UNIVERSITY OF.) The new town lies on a level on the left bank of the river; the old portion ascends the hills on the west shore. The fine French-Gothic cathedral dates from 1260 and was completely restored between 1886 and 1893. The interior contains the splendid burial chapel of Gustavus Vasa. The cathedral also contains a monument to Linnæus, who lived in Upsala.

Among the university buildings in the vicinity of the cathedral are the ancient Gustavianum, the Carolina Rediviva (1841), and the handsome new Renaissance structure completed in 1886. The valuable university library is celebrated for the Codex Argenteus of Ulfilas (q.v.). The botanic garden is very fine. The half-finished historic castle—the Slott—on the hill to the south of the town was built by Gustavus Vasa in 1548, and is now used for the provincial archives. Southeast and stretching along the Fyris is the Strömparterre—a pleasure park called by the students the 'hole of a beehive.' Upsala has an interesting cemetery. South of the city is the noteworthy Ultuna Agricultural Institute. Several miles farther south is the splendid Château of Skokloster. Its origin is due to Marshal Wrangel, who housed here his rich collections accumulated in Germany in the Thirty Years' War. Northeast of Upsala lies the notable village of Gamla Upsala, the capital of the ancient pagan kings, who worshiped here in a celebrated temple. Adjacent are tumuli (about 60 feet high) which were connected with the pagan rites. In the vicinity is the Tingshög—a hill (32 feet high) from which the ancient rulers spoke to the people.

Upsala has an excellent school system, comprising both normal and high schools, a fine hospital, an insane asylum, a royal society of science, a medical association, and an organization for the study of the humanities. The Museum of Northern Antiquities is in the garden of Linnæus. Upsala was formerly an important commercial centre. The trade and manufactures are now unimportant, the town owing its prosperity mainly to the university. Population, in 1901, 23,802.

UPSALA, UNIVERSITY OF. An institution of learning situated at Upsala, Sweden. In 1477 Pope Sixtus IV. gave permission to establish a Studium Generale at Upsala after the model of Bologna and lectures were begun the same year. In 1566 Eric XIV. established a chair of Greek. King John III. established four new professorships, but as the professors refused to assent to the King's Catholicizing acts, the university was closed. It was not until 1593, when the Reformation again gained a strong foothold in Sweden, that the university was reëstablished, with two faculties, theological and philosophical. Gustavus Adolphus endowed the university munificently, thus assuring its material independence. The Gustavianum, one of the oldest buildings, dating from the reign of this monarch, is still extant. In 1902 the university consisted of the faculties of theology, law, medicine, and philosophy. The attendance was 1388. The library, which was enriched considerably by the collections of Gustavus Adolphus, contains over 300,000 volumes and 12,500 pamphlets.

UPSHUR, ŭp′shẽr, Abel Parker (1790-1844). An American statesman, born in Northampton County, Va. He studied law under William Wirt (q.v.), and was in 1810 admitted to the bar. In 1824 he was elected to the State Legislature, in 1826 was appointed a judge of the Virginia General Court, and in 1829 was made a member of the convention for the revision of the State Constitution. President Tyler appointed him Secretary of the Navy in 1841, and in 1843 he was transferred to the post of Secretary of State, left vacant by the resignation of Daniel Webster. He was an extreme supporter of States' rights and slavery. His death was caused by the bursting of a gun on board U. S. S. *Princeton.* He published an *Inquiry Into the Nature and Character of Our Federal Government* (1840).

UP′SON, Anson Judd (1823-1902). An American clergyman and educator, born in Philadelphia, Pa., and educated at Hamilton College and Union College. In 1849 he was appointed professor of rhetoric and moral philosophy at Hamilton, and from 1853 to 1870 was professor of logic and rhetoric there. He then became pastor of the Second Presbyterian Church in Albany. He was appointed professor of sacred rhetoric and pastoral theology at Auburn Seminary in 1880, and in 1887 became professor emeritus. In 1890 he was made chancellor of the University of the State of New York.

UP′TON, Emory (1839-81). An American soldier, born at Batavia, N. Y. He graduated at West Point in 1861; served as aide-de-camp on the staff of General Tyler, and while so doing was wounded in the battle of Bull Run; fought in the Peninsular campaign and in the Maryland campaign; and was commissioned colonel of the 121st New York volunteers on October 23, 1862. He was engaged in the Battle of Fredericksburg; commanded a brigade of the Sixth Corps at Gettysburg, Rappahannock Station, and Mine Run, and in the Wilderness campaign and part of the Richmond campaign. At Spottsylvania in May, 1864, he was wounded while leading the assaulting column of twelve regiments of the Sixth Corps, and as a reward for his gallantry was brevetted lieutenant-colonel of the Twenty-fifth Infantry from 1866. He was wounded at Opequan in the Shenandoah campaign, and for gallant conduct at Winchester was brevetted major-general of volunteers. He later commanded the Fourth Cavalry Division in Gen. J. H. Wilson's operations in Georgia, and for his services in the assault on Selma was brevetted brigadier-general in the Regular Army. After the war he served as lieutenant-colonel of the Twenty-fifth Infantry from 1886 until 1880, when he became colonel of the Fourth Artillery. He was also engaged in preparing a system of tactics for the service, and from 1870 until 1875 was commandant of cadets at the Military Academy at West Point. Not long after his promotion to the rank of colonel his mind became affected and he committed suicide. His published works include: *A New System of Infantry Tactics* (1867; 2d ed. 1874); *Tactics for Non-Military Bodies* (1870); and *The Armies of Asia and Europe* (1878). Consult Michie, *Life and Letters of Major-General Emory Upton* (New York, 1885).

UPTON, George Putnam (1835—). An American musical critic, born in Boston, and educated at Brown University. From 1861 to 1885 he was on the editorial staff of the *Chicago Tribune.* In 1872 he founded and became first president of the Apollo Club. His works include: *Letters of Peregrine Pickle* (1870); *Woman in Music* (1885); *Standard Operas* (1890; 15th ed. 1902); *Standard Oratorios* (1891); *Standard Symphonies* (1892).

UR, ẽr (Heb. *'ūr*, Bab. *Uru*). An ancient metropolis of Southern Babylonia, which has been identified with the modern Mukayyir, generally written Mugheir. This site lies close to the Euphrates, at the point where the canal Shat-el-Hai connects this river with the Tigris, while the Wady Rummein gives it access to Arabia. Hence, it was in a position most eligible for commerce and political greatness, which it enjoyed from the earliest period of Babylonian history. It was the chief seat in Babylonia of the worship of the moon-god Sin, whose massive temple still stands 70 feet above the plain. There are traces of an early dynasty about B.C. 4000, according to one school of chronology, while about B.C. 3000 the kings Ur-Gur and Dungi I. made Ur the capital of "Sumer and Akkad," i.e. Babylonia. Another dynasty, about B.C. 2400, appears, claiming imperial dominion, and from its time there remains an interesting body of contracts, revealing the commercial development of the city. It finally succumbed to Babylon's greatness, but continued a sacred and important place throughout Babylonian history. The biblical passages call it Ur of the Chaldees, and make it the starting point of the migration of Abraham's family westward (Gen. xi. 27-32). As this tradition is preserved in the Priestly Narrative alone, the identification has been doubted by various scholars, who would prefer to find the biblical Ur in the region of the Upper Euphrates. The first examinations of Mukayyir were made by Loftus, and its excavation by J. E. Taylor in 1854. Consult: Rogers, *History of Babylonia and Assyria* (New York, 1901); Hilprecht, *Explorations in Bible Lands* (Philadelphia, 1903). See Abraham.

URABÁ, ōō′rȧ-bä′, Gulf of. The former name for the Gulf of Darien and now applied to the southern portion. See Darien.

URÆMIA (Neo-Lat., from Gk. *οὖρον*, *ouron*, urine + *αἷμα*, *haima*, blood). A disease characterized by convulsions, headache, vomiting, and general malaise, and due to the retention, in the liver and in the blood, of the urea which should be transformed into urates and eliminated with the urine. The symptoms are due to the toxic effect of urea upon the brain and central nervous system. The total daily excretion of urea should be from 300 to 600 grains. If the total remain long under 300, the symptoms of uræmia may follow. Excretion of urea is hastened by the use of the salicylates, purgatives, especially elaterium, hot baths, and cupping over the kidneys.

URAGA, ōō-rä′gȧ. A village in the Province of Sagami, Japan, 15 miles south-southeast of Yokohama. It lies in two divisions on both sides of a narrow harbor. There are two large dry docks. The views in the vicinity are beautiful. Commodore Perry's fleet dropped anchor here on July 8, 1853, and at Kurihama, near by, on July 14th, he met the representatives of the Shogun and delivered President Fillmore's letter. This was the first of the series of events which resulted in the opening again of Japan to foreign intercourse. In 1900 a plot of land was purchased at Kurihama and named Perry's Park, and a monument in his honor was unveiled July 14, 1901. Population, in 1895, 12,719.

U'RAL, ū'ral *or* o͞o'ral, *Russ. pron.* ụ-räl'y'. A river of Eastern Russia, partly on the boundary between Europe and Asia. It rises in the southern Ural Mountains in the Government of Orenburg, and flows first south through one of the eastern longitudinal valleys, then westward around the southern spurs of the mountain system, and finally southward, emptying into the northern extremity of the Caspian Sea after a course of about 1400 miles (Map: Russia, H 4). The rainfall over its basin is but slight, so that the river receives no important tributaries and is unnavigable. The chief towns on its banks are Orsk, Orenburg, Uralsk, and Guriev, the last-named at its mouth.

U'RAL-ALTA'IC. The term commonly employed by anthropologists to designate a branch of the yellow or Asian race, which includes the following groups: Tungusic (Tunguses, Manchus, etc.), Mongolic (Mongols, Kalmucks, etc.), Tataric (Turks, 'Tatars,' part of the Cossacks, Kirghizes, etc.), Finnic (Samoyeds, Finns, Lapps, Magyars, etc.), Arctic (Tchuktchis, Koriaks, Kamchatkans, Giliaks, Ainus), and Japanese-Korean. The civilized and more or less Aryanized Finns and Magyars of Europe, the latter intruding Osmanli Turks of Asia Minor, Southwestern Europe, and Northern Africa, the civilized Turko-Tatar States, ancient and modern, of Turkestan and adjacent parts of Central Asia, the Mongol conquerors of China and India, the Asiatic elements of Korean-Japanese culture, etc., represent the capacities, independent and stimulated by contact with other races and peoples, of the Ural-Altaic tribes. In matters of language these peoples possess generally what are called 'agglutinative' tongues, in contrast with the inflecting Aryan and the monosyllabic Chinese and Indo-Chinese forms of speech. But the Finnish language in Europe has been thought by some either to have Aryan traits or to have given birth to Aryan tongues. Some authorities have included the Korean-Japanese with the Sinitic branch, seeing closer relationship between them and the Chinese than the facts warrant. While the location of the earliest home of the Ural-Altaic peoples is still indeterminable with exactness—it was somewhere between the Ural and the Altai—certain centres of dispersion of its subdivisions can be noted: Mongolia, south of the Altai, Turkestan north of the Pamir, the Uralian country, the Baikal region, the Amur Valley, etc. The careful investigations of the Jesup North Pacific Expedition in Northeastern Asia are thought to have shown the existence of long-continued intercommunication and intermigration between America and Asia in the region bounded by the Amur on the one side and the Columbia on the other. It must be said, however, that the facts point as much to transference of peoples and culture from America to Asia as vice versa; indeed, rather more in the former direction. This would be in line with the fact that the presence of the Eskimo (q.v.) in the northeastern corner of Asia now is the only convincing proof we have of the transit of any people from one continent to the other. The variety of the response of the Ural-Altaic peoples to foreign culture is seen in their religions. The uncivilized tribes are mostly devotees of Shamanism, as of old, but the Mongols, Manchus, Buriats, Kirghiz-Kalmuck Tatars, and to some extent Koreans and Japanese are Buddhist, the Bashkirs, Turks, etc., are Mohammedans, the greater part of the Kamchatkans, Tchuvashes, part of the Yakuts and of some other Siberian tribes, are Christians of the Russian (Greek) Church, the Magyars are about three-fifths Catholic and two-fifths Protestant, and the Finns for the most part Lutheran. Consult: Castrén, *Ethnologische Vorlesungen über die altaischen Völker* (Saint Petersburg, 1857); Schott, *Altaische Studien* (Berlin, 1860-72); Mistelli, *Der altaische Sprachtypus* (Basel, 1883); Winkler, *Uralaltaische Völker und Sprache* (Berlin, 1884); id., *Das Uralaltaische und seine Gruppen* (ib., 1885); Grunzel, *Entwurf einer vergleichenden Grammatik der altaischen Sprachen* (Leipzig, 1895).

URALITE. A variety of amphibole derived from pyroxene. Its crystals, when distinct, show the form of the original mineral, but have the cleavage of amphibole. The crystals vary in color from pale to deep green, and are found at various localities, as in the Ural Mountains and at Canaan, Conn.

URAL (ū'ral *or* o͞o'ral) **MOUNTAINS.** A mountain range in Russia, forming part of the conventional boundary between Europe and Asia. It extends in a general north and south direction along the 60th meridian of east longitude from the 65th degree of latitude (from which northward to the Kara Sea the course is northeast) south to the north bank of the Ural River (Map: Russia, K 3). A northern extension reappears beyond the Yugor and Kara Straits to form the main range of the islands of Vaigatch and Nova Zembla, while a southern extension, known as the Mugodzhar Mountains, runs south of the Ural River nearly to the shores of the Sea of Aral. The distance in a straight line between the southern and northernmost extremities of the range is 2000 miles, but the actual length of the somewhat sinuous main ridge is still greater. The Ural Mountains do not form a single range, but constitute rather a broad plateau 45 miles wide in the north and nearly 200 miles wide in the south. This plateau is broken up partly into a number of separate ridges or chains running in various directions, partly into broad dome-shaped masses, though the southern portion divides itself into several parallel north and south branches. The eastern slope is generally the more abrupt, the western falling in broad, flat terraces toward the lowlands. The average elevation of the main crests is not great, scarcely more than 1500 feet. Mount Tel-pos is 5433 feet above the sea. The climate is rather severe, with very cold winters and hot summers. The rainfall is greater on the western slope and in the central and northern portion than in the east and south. The range is a watershed of the Obi in the east, the

Ural in the south, and the Volga and Petchora on the west. The vegetation in the southern portion consists mainly of steppes with isolated oases of trees. The central portion is covered with immense forests of spruce, larch, and firs, which in the north give place to dwarf birch and mossy tundras. Geologically, the range consists of a central longitudinal zone of metamorphic slates, granites, gneisses, and syenites, flanked on either side by sedimentary strata, which are chiefly Carboniferous and Permian in the western, and Cretaceous and Jurassic in the eastern zone. In the southeast there are large Devonian outcrops and intrusions of quartz and porphyry. The Ural Mountains are extremely rich in minerals, which are chiefly confined to the central division, the northern parts being barren. There are rich deposits of iron ore—magnetite, limonite, and red hematite. Nearly 1½ million tons of ore are produced annually and smelted into pig iron on the spot, the vast forests yielding an inexhaustible supply of fuel. Gold is mined both from veins and placers, and other rare metals, platinum, iridium, and osmium, are comparatively abundant. The Urals yield 90 per cent. of all the platinum produced in the world. Precious stones are also mined, as well as copper, silver, mercury, cobalt, nickel, and zinc. Coal beds exist on the western slope, but are not yet mined to any great extent. Asbestos is one of the distinctive mineral products of the mountains. This mineral wealth has given rise to important industries, and a large number of populous towns have sprung up among the mountains, while a considerable agricultural population has also been attracted.

Consult: Ludwig, *Ueberblick der geologischen Beobachtungen* (Leipzig, 1862); Hochstetter, *Ueber den Ural im Ural* (Berlin, 1873); Hiekisch, *Das System des Urals* (Dorpat, 1882).

URALSK, o͞o-räl′y'sk. A territory of Russia, lying mostly east of the Ural River, the boundary line between Europe and Asia (Map: Russia, H 5). Area, over 125,100 square miles. The surface generally presents a series of dry steppes and deserts sloping gradually to the Caspian. Much of the interior lies below the level of the Caspian. There are many salt lakes, and only the Ural (q.v.) and the Emba (during a part of the year) reach the Caspian, the other streams being lost in the lakes or in the sand. Uralsk is scantily watered, and there are places where even wells are lacking. The climate is continental, the influence of the Caspian Sea being confined to the coast region. The temperature is subject to wide fluctuations, and the precipitation is slight. In the winter the snowstorms are very destructive. Uralsk contains little cultivable land, and agriculture is of secondary importance, the chief occupations being stock-raising and fishing. The fisheries along the Ural and the coast of the Caspian Sea are among the most extensive and the best regulated in Russia. The value of the fish, caviar, fish oil, and other fish products exported from the territory exceeds $1,500,000. The population was 691,887 in 1901. Capital, Uralsk.

URALSK. The capital of the Territory of Uralsk, in Southeastern Russia, at the confluence of the Ural with the Tchagan, 980 miles southeast of Moscow (Map: Russia, H 4). It is a well laid out town with an industrial school for Kirghizes and a natural history museum. It is the commercial centre of the province. Population, in 1897, 38,919. The town was founded at the beginning of the seventeenth century.

URA′NIA (Lat., from Gk. *Οὐρανία*, *Ourania*, the Heavenly One, from *οὐρανός*, *ouranos*, heaven, sky; connected with Skt. *Varuṇa*, Varuna, god of the sky and waters, from *var*, to cover). One of the Muses (q.v.). In the later division of functions among the Muses, she became the guardian of Astronomy, or rather of the astronomical epic, such as was written by Aratus. She seems to be indicated in the groups of Muses by the globe.

URANINITE. A mineral uranium oxide usually found in the form of botryoidal or compact masses and often containing such impurities as silica and the oxides of iron, lead, calcium, and magnesium. It is opaque, grayish, greenish, or brownish black in color, with a sub-metallic lustre, and has a conchoidal fracture. It occurs often with ores of silver and lead, in Bohemia, Saxony, Hungary, Turkey, etc. See also RADIUM; POLONIUM; RADIOACTIVITY.

URANIUM (Neo-Lat., named after the planet Uranus). A metallic element discovered by Klaproth in 1789. It is found chiefly as an oxide in the mineral uraninite or pitchblende, which occurs at various localities in Norway, Saxony, Cornwall, and the United States, and also in various other minerals, but in smaller quantities. An important source of uranium compounds in recent years is the uran-ochre from Cornwall, England. The metal itself may be obtained by reducing uranous chloride by sodium or potassium in a crucible packed with charcoal, which is slowly heated to redness in a furnace.

Uranium (symbol, U; atomic weight, 239.59) is a hard silvery-white metal with a specific gravity of 18.68. It melts at a bright red heat. It combines with oxygen to form a dioxide and a trioxide, which unite with bases to form uranous and uranic salts. Perhaps the most important of the salts is sodium uranate, known as uranium yellow, that is used for painting on glass and porcelain, as well as in making the fluorescent yellow 'uranium glass.' The two oxides combine to form a green uranoso-uranic oxide that is also formed when uranium is burned in the air. This oxide is used sometimes to produce a black glaze on porcelain.

URANIUM RAYS. Certain radiations discovered by Professor Becquerel in 1896 to be emitted by the salts of uranium and the metal itself, and not to obey the laws of light or ether waves. This radiation has been shown by Rutherford to consist of two quite distinct groups of rays. Both affect photographic plates, both ionize gases (see IONIZATION), and both penetrate many bodies which are opaque to light; the two groups are distinguished by their different penetrative powers, and consequent different ionizing powers. The more penetrating rays have less ionizing power and are deflected by a magnet and by an electrostatic field, much more than the other rays, but in an opposite direction. There are several other 'radioactive' substances, as such bodies are called, which emit radiations like uranium: thorium and its salts, polonium, radium, and actinium. The radioactivity of thorium oxide was discovered independently in 1898 by Madame Curie and G. C. Schmidt; M. and Mme. Curie isolated polonium and radium from pitchblende; and Debierne has isolated actinium from the same ore. These new substances are much more intense in their action than is uranium. (See RADIOACTIVITY.) These radiations are not reflected, refracted, diffracted, or polarized. See X-RAYS.

U'RANUS (Lat., from Gk. Οὐρανός, *Ouranos*, heavens, sky). In Greek theogony, the husband of Gæa, the Earth, and, according to Hesiod, father of the Titans, Cyclopes, and Hecatoncheires. Legend represented him as dethroned and mutilated by his son Cronos. (See SATURN.) From his blood, which fell upon the earth, sprang the Gigantes, while the part which fell into the sea was washed about until from the foam which gathered rose Aphrodite. Uranus was never an object of worship, but rather, like Cronos, a conception formed from the cult of Zeus for the purpose of a constructive theogony. Among the Romans Cælus appears in myth as a translation of the Greek name, but not as a deity of the Roman religion.

URANUS. The next to the outermost member of the solar system. Its mean distance from the sun is 1,782,000,000 miles; sidereal period, 84 years; eccentricity not quite $\frac{1}{20}$ or about the same as that of Jupiter; inclination to the ecliptic, 46'. It is about 66 times greater than the earth in volume and 15 times in mass, and its density and surface-gravity respectively are 0.22 and 0.9. In the telescope the planet appears as a greenish disk of about 4" diameter. The greenish tinge is explained as due to some unidentified substance in the planet's atmosphere. Because of its immense distance, astronomers have been unable to gain much information concerning it. Spots and belts have been seen, but they are too faint to warrant any positive assertion, and the time of rotation of the planet is unknown. Uranus was accidentally discovered by Sir William Herschel on March 13, 1781, and was named 'the Georgium Sidus' and 'Herschel,' but these names soon fell into disuse and the name of Uranus, suggested by Bode, finally prevailed. Herschel announced the discovery as that of a comet, and its planetary nature was not demonstrated until three or four months later by Lexell, of Saint Petersburg. Before its detection by Herschel, Uranus had been recorded no less than 20 times as a fixed star, 12 times by Lemonier alone. These observations when compared with more recent ones showed that the planet was wandering from its track. The attempts made to account for these irregularities led to the discovery of Neptune (q.v.).

Uranus has four satellites:

NAME	Distance from planet in miles	Sidereal. period
Ariel	120,000	$2^d\ 12^h\ 29^m$
Umbriel	170,000	$4^d\ 3^h\ 27^m$
Titania	280,000	$8^d\ 16^h\ 57^m$
Oberon	375,000	$13^d\ 11^h\ 7^m$

Oberon and Titania were discovered by the elder Herschel, January 11, 1787, the other two were discovered by Lassell, October 24, 1851. They are estimated to vary in size from 200 to 500 miles in diameter. The plane of their orbit is inclined 82.2° to the plane of the ecliptic and their motions, like that of the satellite of Neptune, is retrograde, i.e. from east to west. See PLANETS.

URASHIMA TARO, ōō'rȧ-shē'mȧ tä'rō. In Japanese legend, the story of a fisher-boy who was taken down on the back of a tortoise into the palace of Riu-gu, or the realm of the dragon-king of the world under the sea, and there in blissful dalliance knew nothing of the flight of time. Returning to the earth for a brief visit to his parents, he finds all strange in his native village, enters the old cemetery, and, against the express orders of the sea-king's daughter, opens the casket she has given him, only to find himself an old man soon to die. This is a favorite theme with native artists. The legend is one of the oldest in the language, and is first found in writing in the *Manyōshiu*, "Collection of a Myriad Leaves of Poetry," of the seventh and eighth centuries. The official annals give A.D. 477 and 825 as the dates of his disappearance and return. His tomb, with his fishing-line and the casket he had received from the dragon-king's daughter, are still shown in a temple at Kanagawa, near Yokohama. The myth of Urashima is the Japanese version of the Oriental legend of the Seven Sleepers, represented in America by the story of Rip Van Winkle.

URATYUBE, ōō'rȧ-tyōō'be. A town in the Territory of Samarkand, Russian Turkestan, 55 miles southwest of Khodjend (Map: Asia, Central, L 2). It is surrounded by a wall and has a Russian quarter. The chief articles of trade are horses and camel-wool cloth. Population, in 1897, 20,837, chiefly Uzbegs. Uratyube was founded, according to local tradition, by Cyrus. It was taken by the Russians in 1866.

UR'BAN. The name of eight popes. URBAN I., SAINT, Pope 222-230. His pontificate, coming under the reign of the Emperor Alexander Severus, was little disturbed by external persecution. The schismatic movement fostered by the self-willed rigorist Hippolytus still continued; but Urban, like his predecessor Calixtus (or Callistus) I., set himself firmly against it.—URBAN II., Pope 1088-99, originally Othon by name. He was Archdeacon of Auxerre, and then entered the Monastery of Cluny, where he became prior. Gregory VII. called him to Rome and made him Bishop of Ostia. His election to the Papacy was contested by the Imperial candidate, Guibert of Ravenna, under the name of Clement III., and the first years of his pontificate were a time of constant strife. Urban II. successfully prosecuted the struggle of the Papacy against the Emperor Henry IV., which had been inaugurated by Gregory VII. In 1094 he excommunicated Philip I. of France for his matrimonial infidelity. He presided at the famous Council of Clermont in 1095, which gave the impulse to the Crusades. The most important event of the last years of his pontificate was holding a council at Bari in 1098, at which many Greek bishops were present, and in which the addition of the word *filioque* to the creed was discussed. He died in the close of 1099, just at the time when the First Crusade, which he had organized, terminated in the successful occupation of Jerusalem.—URBAN III., Pope 1185-87, Uberto Crivelli. Before his elevation to the Papacy he was Archbishop of Milan. He was an opponent of Frederick Barbarossa. The Emperor besieged the Pope in Verona, but was recalled to Germany by tidings of revolt there, and Urban was on the point of excommunicating him when he died near Ferrara, it is said of a broken heart, on hearing of the capture of Jerusalem by Saladin.

Urban IV., Pope 1261-64, Jacques Pantaléon. He was the son of a shoemaker of Troyes, and rose by his talents and virtues to high positions in the Church, becoming titular Patriarch of Jerusalem in 1255. He was elected Pope at Viterbo, and spent the whole of his pontificate there and at Orvieto, being excluded from Rome by the power of Manfred, natural son of the Emperor Frederick II., against whom he incited Charles of Anjou to take up arms. He preserved a strict neutrality between the rival candidates for the Empire, and in the difficulties between Henry III. of England and his barons took the side of the King. The nomination of numerous French cardinals led to the preponderance of that party, and so ultimately to the great schism. Consult: Dorez and Guiraud, *Les régistres d'Urbain IV.* (Paris, 1892), and a biography by Georges (ib., 1865).—Urban V., Pope 1362-70, Guillaume de Grimoard. The cardinals could not agree upon one of their own number, and therefore elected him, then Abbot of Saint Victor at Marseilles. This was at the time of the Papal residence at Avignon, whence Urban III. sent a legate to reduce his rebellious subjects in Rome. In 1367, however, he resolved to return thither in person. Finding the Papal city in a condition all but ruinous, and having endeavored with little success to repress the disorder of the times, he returned to Avignon in 1370. Here he died less than a month after his return, leaving the reputation of great personal piety and zeal for the interests of religion. Consult: Magnan, *Histoire d'Urbain V.* (2d ed., Paris, 1863); Kirsch, *Die Ruckkehr der Päpste Urban V. und Gregor XI. von Avignon nach Rom* (Paderborn, 1898).

Urban VI., Pope 1378-89, Bartolommeo Prignano. At the time of his election he was Archbishop of Bari. On the death of Gregory XI., who had brought back the seat of the Papacy from Avignon to Rome, Prignano was elected in a conclave held under circumstances of great excitement, owing to the apprehension on the part of the populace of an intention to elect a French pope and again abandon Rome. The most important aspect of his pontificate is that relating to the Great Schism (see Schism, Western), which arose out of the conflicting claims to the election. While the candidate of the French cardinals took up his residence at Avignon, under the name of Clement VII., Urban occupied the Papal seat in Rome. After a dispute with Charles, King of Naples, whom he had himself crowned, he died of a fall from his horse, though there were the usual suspicions of poison.—Urban VII., Pope 1590, Giovanni Castagna. He had been a member of the Council of Trent in its last period, and then for several years nuncio in Spain. Elected to succeed Sixtus V., he died twelve days later, before he could be consecrated.—Urban VIII., Pope 1623-44, Maffeo Barberini. He was born in Florence, 1568, educated at Rome and Pisa, and destined for an ecclesiastical career. After serving twice as nuncio to France, he was made cardinal in 1606. Urban VIII. was guilty of nepotism; but his administration was, on the whole, vigorous and enlightened. He was the founder of the celebrated College of the Propaganda, and to him Rome is indebted for many public works. Some of the early stages of the Jansenist controversy (see Jansenism) fall within his pontificate. In the Thirty Years' War he sided with France against the Emperor and Spain. In his pontificate the Duchy of Urbino was annexed to the Papal dominions.

URBAN'A. The county-seat of Champaign County, Ill., 128 miles south by west of Chicago; on the Cleveland, Cincinnati, Chicago and Saint Louis Railroad, and a branch of the Wabash (Map: Illinois, D 3). It is the seat of the University of Illinois (q.v.), opened in 1868. The public library has more than 8000 volumes; and there are also the Champaign County Teachers' and Pupils' Library, and the Illinois State Laboratory and Natural History Library. Other prominent features include the County Court House, the Municipal Building, and the Masonic Temple, and Crystal Lake Park. Urbana is the centre of a rich farming section, and manufactures brick and tile, lawn mowers, iron novelties, and suspenders. The Cleveland, Cincinnati, Chicago and Saint Louis Railroad maintains extensive shops here. The government is vested in a mayor, chosen biennially, and a unicameral council. Urbana was chartered as a city in 1855. Population, in 1890, 3511; in 1900, 5728.

URBANA. The county-seat of Champaign County, O., 47 miles west by north of Columbus; on the Erie, the Cleveland, Cincinnati, Chicago and Saint Louis, and the Pittsburg, Cincinnati, Chicago and Saint Louis railroads (Map: Ohio, C 5). It is the seat of Urbana University (Swedenborgian), and has a public library. Urbana is surrounded by a productive farming region, and is of considerable industrial importance. Furniture, bicycle rims, and strawboard are the leading manufactures. The government is vested in a mayor, chosen biennially, and a unicameral council. Urbana was laid out in 1805, and for a time in 1812 was the headquarters of the Northwestern Army. It was the home of the famous Indian fighter Simon Kenton. Population, in 1890, 6510; in 1900, 6808.

URBAN SERVITUDES (from Lat. *urbanus*, relating to a city, from *urbs*, city). Easements or rights existing for the convenience or benefit of houses or other buildings, over lands or buildings belonging to a different owner. The term is employed to distinguish such servitudes from those established for the benefit of land only, which are known as rural servitudes. The most important urban servitudes are: The right to support—that is, of resting joists and other timbers on an adjoining building; the right to have rain drip from the eaves of a building on another's land or building; the right to establish and maintain windows overlooking another's land; the rights of air and access. Consult Washburn on *Easements*. See Easements.

URBINO, o͞or-bē′nō. A city in the Province of Pesaro e Urbino, Italy, situated on a hill amid the eastern outliers of the Apennines, between the Metauro and the Foglia, 25 miles southwest of Pesaro (Map: Italy, G 4). The streets are narrow and tortuous, but gorgeous views are obtained of the mountains and the Adriatic. The house in which Raphael was born is now fitted up as a museum, and belongs to the 'Reale Accademia Raffaello.' The new cathedral is interesting for its paintings. In the Church of Santo Spirito are noteworthy pictures by Luca Signorelli, and in the San Domenico are good reliefs by Luca della Robbia. The Oratorio della Confraternità di San Giovanni Battista is a splendid structure. The famous ducal palace was erected in the fifteenth century. It is rich in interesting sculptures and decorations, and has a collection of Roman inscriptions and a biblical picture gallery. The city has a free university, founded in 1671, and an academy of fine arts. The celebrated library has been removed to Rome. Urbino manufactures silks, majolica, bricks, lime, oil, and cheese. There are in the vicinity sulphur and travertine quarries. Population (commune), in 1881, 16,812; in 1901, 18,307.

Urbino, the ancient Urbinum, was an important city under the Romans. It became very prosperous in the fourteenth century. Federigo da Montefeltre, who ruled from 1444 to 1482 and who was elevated by the Pope to the dignity of Duke of Urbino in 1474, maintained a magnificent court, built the palace, and made the city a centre of science and art. During the sixteenth century, under the Della Rovere family, Urbino was important in the manufacture of majolica. It was a Papal possession from 1626 to 1860.

URDANETA, o͞or'dȧ-nä'tȧ. A town of Luzon, Philippines, in the Province of Pangasinán, situated 27 miles southeast of Lingayen (Map: Luzon, D 3). Population, about 16,600.

URDU, o͞or'do͞o. The speech of the Mohammedan population of Central Hindustan, and a sort of *lingua franca* for almost all the peninsula. See HINDUSTANI LANGUAGE AND LITERATURE.

URE, ANDREW (1778-1857). A Scotch chemist, born at Glasgow. He studied at Glasgow and Edinburgh. In 1802 he became professor of chemistry and natural philosophy in the Andersonian Institution at Glasgow; took an active part in the establishment (1809) of the Glasgow Observatory, and was appointed its first director. In 1830 he removed to London, and in 1834 he was appointed analytical chemist to the Board of Customs. He published a number of valuable works, his two dictionaries remaining for many years the standard books of reference: viz. his *Dictionary of Chemistry* (2 vols. 1821), and *A Dictionary of Arts, Manufactures, and Mines* (1837 and several later editions). Among his other works may be mentioned the *Systematic Table of the Materia Medica* (1813); *A New System of Geology* (1829); the *Philosophy of Manufactures* (1835); and *The Cotton Manufacture of Great Britain Compared with That of Other Countries* (1836 and 1861).

UREA (Neo-Lat., from Gk. *οὖρον*, *ouron*, urine), or CARBAMIDE, $CO(NH_2)_2$. An organic substance which derives its name from its having been originally discovered in urine, of which it forms the most important and characteristic ingredient. Pure urea, which has been allowed to crystallize slowly, occurs in white, glistening, streaked, four-sided prisms; but when the crystallization is rapid or disturbed, it separates in small white silky needles. It is devoid of smell, has a coolish, bitter taste, like that of saltpetre (which it closely resembles in its external form), and is very slightly deliquescent. It is readily soluble in water and alcohol, but only slightly in ether. Pure urea melts at 132° C.; dry urea may be sublimed without decomposition by heating in vacuo between 120° and 130° C. If heated, under ordinary pressure, above these temperatures, it is decomposed with formation of ammonia, cyanuric acid, biuret, and carbonic acid; the formation of biuret is represented by the following chemical equation:

$$\underset{\text{Urea}}{2CO(NH_2)_2} = \underset{\text{Biuret}}{NH_2CONHCONH_2} + \underset{\text{Ammonia.}}{NH_3}$$

The formation of cyanuric acid ($C_3H_3N_3O_3$) takes place indirectly, probably through the combination of biuret with cyanic acid. If heated with water at 120°, or if boiled with dilute mineral acids, urea combines with water, yielding ammonia and carbonic acid according to the following equation:

$$\underset{\text{Urea}}{CO(NH_2)_2} + 2H_2O = \underset{\text{Carbonate of Ammonia.}}{(NH_4)_2CO_3}$$

A similar change takes place at ordinary temperatures in urine exposed for some time to the air. Here the transformation is effected through a process of fermentation caused by certain micro-organisms producing, when killed, an enzyme that hydrolyzes urea with great rapidity. This enzyme is probably secreted also by the mucous membrane of the bladder in certain inflammatory conditions, the fermentation then taking place while the urine is still in the bladder.

The following are some of the most important of the compounds of urea: *Nitrate of urea*, $CO(NH_2)_2.HNO_3$, and *oxalate of urea*, $2CO(NH_2)_2.H_2C_2O_4$, are readily crystallizable salts, formed by the direct addition of the respective acids to a moderately strong solution of urea. As nitrate of urea requires eight parts of cold water, and is still more insoluble if an excess of free nitric acid is present, and the oxalate is more insoluble than the nitrate, while urea dissolves in its own weight of water, these salts may be employed to test for and approximately determine the quantity of urea. Among the compounds of urea with metallic oxides, those which it forms with the oxides of mercury are especially interesting, and have been completely examined by Liebig. A result of his researches is his celebrated method, which is now in universal use, of determining the amount of urea volumetrically. The following are other accurate methods of determining urea quantitatively: (1) Knop-Hüfner's method consists in decomposing urea into nitrogen and carbonic acid, with sodium hypobromite, and determining the volume of nitrogen produced from which the amount of urea can be readily calculated. (2) An excellent method devised by Bunsen consists in heating urea in a sealed glass tube with barium chloride, which breaks up urea into carbonic acid and ammonia, the former combining with barium chloride to give the insoluble barium carbonate which is readily isolated, dried and weighed; the weight of barium carbonate gives the weight of carbonic acid produced in the decomposition, and hence, by a simple calculation, the weight of urea decomposed. The presence of urea may be readily detected by means of the biuret reaction. It has been mentioned above that when urea is decomposed by heating, biuret is produced along with several other products of decomposition. Now, when biuret is dissolved in water, then some caustic soda and a little dilute copper sulphate solution added, a characteristic pink coloration is produced. To detect urea, therefore, the dry substance submitted for examination, or the residue left on evaporating a solution, is heated for some time at 150° C., then dissolved and treated with caustic soda and copper sulphate, a pink coloration produced proving the presence of urea.

Urea was discovered in urine in 1773, and it was the first organic compound produced artificially in the chemical laboratory—a synthesis of vast importance in the history of chemistry. (See CHEMISTRY.) It was then (1828) obtained by Wöhler (q.v.) by heating a solution of ammonium cyanate, the transformation taking place according to the following chemical equation:

$$\underset{\text{Ammonium cyanate}}{NH_4OCN} = \underset{\text{Urea.}}{CO(NH_2)_2}$$

Urea has since been made artificially in a variety of ways; for instance, by treating ammonia with phosgene gas (carbonyl chloride), the following reaction readily taking place:

$$\underset{\text{Phosgene gas}}{COCl_2} + \underset{\text{Ammonia}}{4NH_3} = \underset{\text{Urea}}{CO(NH_2)_2} + \underset{\text{Ammonium chloride.}}{2NH_4Cl}$$

This synthesis is important inasmuch as it explains the structure of urea, the molecule of the latter evidently consisting of one carbonyl (CO) group and two NH_2 groups; therefore, urea is considered as the diamide of carbonic acid [$CO(OH)_2$] and is chemically called *carbamide.*

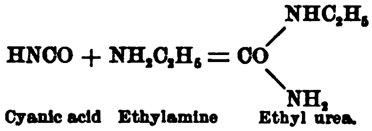
Urea is best prepared in the laboratory by heating phenyl carbonate with ammonia:

$$(C_6H_5)_2CO_3 + 2NH_3 = CO(NH_2)_2 + 2C_6H_5OH.$$

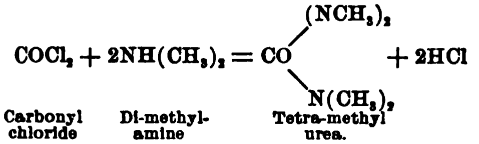
It may be obtained from urine by evaporating to a small volume and adding nitric acid; the nitrate of urea thus obtained is purified by crystallization from nitric acid, decomposed with barium carbonate, and the urea set free is dissolved out of the mixture thus obtained with alcohol.

Urea occurs more abundantly in the urine of carnivorous than in that of herbivorous animals. Small quantities of urea are present also in the urine of birds. The average amount of urea normally excreted by the human adult in a day is 33 grams, the quantity varying between 22 and 35 grams. Urea is also a constituent of the fluids of the eye, of the sweat, and, in minute quantity, of the blood and of the liquor amnii (of the fœtus). There can be no doubt that it is a final product of the regressive metamorphosis of the living tissues, or of their disintegration into simpler compounds, by means of which the final elimination of the worn-out structures is effected. In what way this process of disintegration takes place in the animal body is not known; though various hypotheses have been advanced in explanation of this important phenomenon. Since urea is readily produced from ammonium cyanate and is with equal readiness transformed into ammonium carbonate (see above), it may be that the decomposition of proteids in the body gives rise first to the formation of one or both of these substances, which are subsequently changed into urea. Such explanations, however, are rather vague; for, although cyanogen compounds are manufactured for practical purposes chiefly from nitrogenous animal refuse, the nature of the chemical transformations taking place during the process is not understood. The cyanate hypothesis is attractive inasmuch as the transformation of cyanogen compounds into urea might serve as a source of much energy, cyanogen compounds possessing great molecular energy, while urea possesses much less energy and is much more stable.

UREAS, THE COMPOUND. A large class of organic substances, for the knowledge of which chemistry is mainly indebted to A. W. Hofmann. It is stated in the article on UREA (q.v.) that that important substance can be obtained by the action of ammonia either on cyanic acid (synthesis of urea by heating an ammonium cyanate solution), or on phosgene gas (carbonyl chloride). Similar transformations take place if, in place of ammonia, compounds are employed which are derived from ammonia by replacing hydrogen in the latter by alcohol radicles, such as methyl (CH_3) or ethyl (C_2H_5). In these cases, however, not urea itself, but a series of compound ureas are obtained, which are said to be derived from urea by substituting an alcohol radicle for hydrogen. These compound ureas are very similar in their chemical behavior to urea itself, and, like urea, form salts with acids. Most of the ureas are crystalline solid substances. Those, however, which are derived by replacing *all* the hydrogen of urea are liquids that boil at high temperatures and distil without decomposition. *Ethyl urea* and *tetra-methyl urea* are formed by the above methods, according to the following chemical equations:

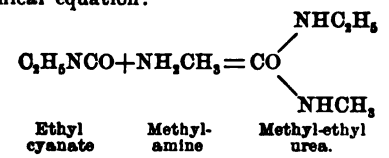


$$\underset{\text{Cyanic acid}}{HNCO} + \underset{\text{Ethylamine}}{NH_2C_2H_5} = \underset{\text{Ethyl urea.}}{CO\begin{cases} NHC_2H_5 \\ NH_2 \end{cases}}$$



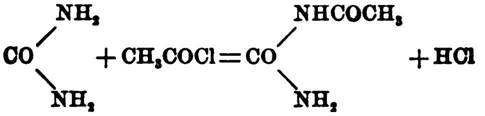
$$\underset{\text{Carbonyl chloride}}{COCl_2} + \underset{\text{Di-methyl-amine}}{2NH(CH_3)_2} = \underset{\text{Tetra-methyl urea.}}{CO\begin{cases} N(CH_3)_2 \\ N(CH_3)_2 \end{cases}} + 2HCl$$

Certain compound ureas may be obtained by using ethereal salts of cyanic acid; thus *symmetrical methyl-ethyl urea* is obtained by the action of methylamine on ethyl cyanate, the reaction taking place according to the following chemical equation:



$$\underset{\text{Ethyl cyanate}}{C_2H_5NCO} + \underset{\text{Methyl-amine}}{NH_2CH_3} = \underset{\text{Methyl-ethyl urea.}}{CO\begin{cases} NHC_2H_5 \\ NHCH_3 \end{cases}}$$

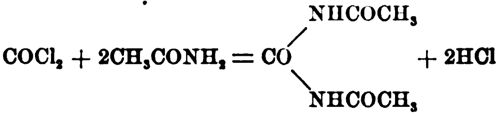
Another important series of compound ureas is obtained by substituting for hydrogen in urea the radicles of organic acids. These ureas are called *ureides.* One of the hydrogen atoms of urea can be replaced by an acid radicle by the direct action of the chloride of the acid radicle on urea; thus *mono-acetyl urea* is formed according to the following equation:



$$\mathrm{CO}\begin{array}{l}\diagup \mathrm{NH_2}\\ \diagdown \mathrm{NH_2}\end{array} + \mathrm{CH_3COCl} = \mathrm{CO}\begin{array}{l}\diagup \mathrm{NHCOCH_3}\\ \diagdown \mathrm{NH_2}\end{array} + \mathrm{HCl}$$

Urea Acetyl chloride Acetyl urea.

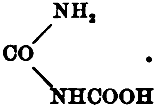
Other methods, however, must be employed for the purpose of introducing more than one acid radicle; thus symmetrical *di-acetyl urea* is obtained by the action of acetamide upon carbonyl chloride, the reaction taking place according to the following chemical equation:



$$\mathrm{COCl_2} + 2\mathrm{CH_3CONH_2} = \mathrm{CO}\begin{array}{l}\diagup \mathrm{NHCOCH_3}\\ \diagdown \mathrm{NHCOCH_3}\end{array} + 2\mathrm{HCl}$$

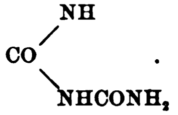
Carbonyl chloride Acetamide Di-acetyl urea.

Among the important ureides is that of carbonic acid, called *allophanic acid.* Its formula is



$$\mathrm{CO}\begin{array}{l}\diagup \mathrm{NH_2}\\ \diagdown \mathrm{NHCOOH}\end{array}$$

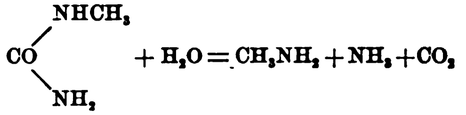
. It is an exceedingly weak acid, its alkaline salts being decomposed even by carbonic acid. The substance biuret, formed by heating urea somewhat above 150° C. (see UREA), is the amide of allophanic acid, its formula being



$$\mathrm{CO}\begin{array}{l}\diagup \mathrm{NH}\\ \diagdown \mathrm{NHCONH_2}\end{array}$$

. See also URIC ACID.

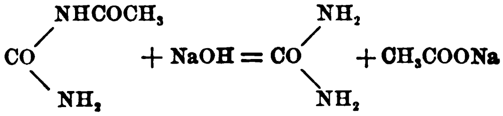
When the alkyl ureas (i.e. the compound ureas formed by replacing hydrogen in urea by alcohol radicles) are boiled with alkalies, decomposition ensues resulting in the formation of amines, ammonia, and carbonic acid. Methyl urea, for instance, is thus hydrolyzed according to the following chemical equation:



$$\mathrm{CO}\begin{array}{l}\diagup \mathrm{NHCH_3}\\ \diagdown \mathrm{NH_2}\end{array} + \mathrm{H_2O} = \mathrm{CH_3NH_2} + \mathrm{NH_3} + \mathrm{CO_2}$$

Methyl urea Methylamine.

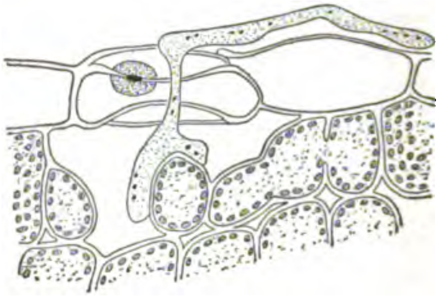
The ureides are more or less readily saponified by the action of alkalies; acetyl urea, for instance, being decomposed according to the following equation:



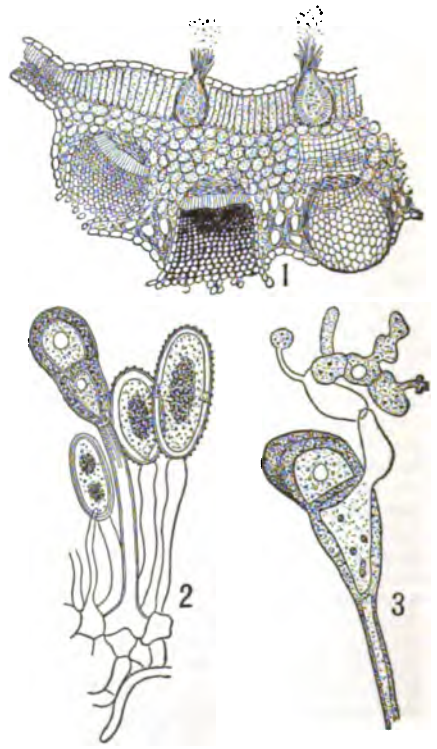
$$\mathrm{CO}\begin{array}{l}\diagup \mathrm{NHCOCH_3}\\ \diagdown \mathrm{NH_2}\end{array} + \mathrm{NaOH} = \mathrm{CO}\begin{array}{l}\diagup \mathrm{NH_2}\\ \diagdown \mathrm{NH_2}\end{array} + \mathrm{CH_3COONa}$$

Acetyl urea Urea Sodium acetate.

UREDINALES, ū-rĕd'ĭ-nā'lēz (Neo-Lat. nom. pl., from Lat. *uredo*, blight, blast, from *urere*, Skt. *uṣ*, to burn). A group of fungi familiarly called 'rusts' which live as parasites on flowering plants. It includes very many species, which have complicated and diverse life-histories, but are identified by the teleutospore stage, this being normally a resting period in the life history. The teleutospores are formed after a period of active vegetation and previous to some unfavorable season, as winter. They are one to several-celled, and exhibit such a variety in structure that they serve to distinguish the various genera. After the return of a favorable season each cell of the teleutospore produces a short filament (promycelium), each of whose cells, generally four in number, develops a small spore (sporidium) which serves to infect the proper host. There are some rusts, confined to one host, that never produce more than two forms of spores (teleutospores and sporidia), that alternate with one another. Most rusts, however, have other forms of spores. Conspicuous among them are the uredospores, somewhat similar to



GERM TUBE OF A RUST ENTERING A LEAF THROUGH A STOMA.



RUST.

1, Section of leaf of barberry with cluster cups (æcidia) below and spermogonia above; 2, uredospores and one teleutospore; 3, germinating teleutospore with four-celled promycelium.

teleutospores. They are one-celled, and are formed during the vegetative season before the teleutospores. They are especially conspicuous on some species of Puccinia that grow on oats and wheat, and most of the so-called 'rust' of these cereals is due to the development of immense numbers of uredospores collected in spots and lines along the leaves and stems. The most complicated life-histories, however, include still another form of fructification (æcidium or 'cluster-cup'), in which the spores are found in parallel chains at the bottom of a cup-like structure. The cluster-cups are generally found on a different host plant from the teleutospores, so that such rusts must depend on two hosts for the completion of their life-history. For example, in the well-known wheat rust (*Puccinia graminis*) the sporidia germinate on the barberry, producing there the cluster-cups (æcidia); while the æcidial spores are carried to wheat, oats, and other cereals, where several generations of uredospores (red rust) may be developed. The uredospores, being scattered, germinate on other individuals, spreading the rust very rapidly. Finally, at the end of the season teleutospores (black rust) are formed. Another interesting life-history is that of the apple rust. (See Apple, paragraph *Diseases*.) Uredospores may survive unfavorable seasons and propagate rust the following year. This probably accounts for the abundance of wheat rust in the Western United States and Australia, where there are no wild barberries. In these regions the barberry (cluster-cup) phase of the life-history is omitted, and the uredospores, or perhaps the sporidia, germinate directly upon the wheat. The rust is due to certain species of Puccinia whose cluster-cups are on plants other than the barberry.

Consult: Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig, 1887—); Plowright, *British Uredineæ and Ustilagineæ*.

URE'NA (Neo-Lat., from *uren*, the native Malabar name). A genus of herbs of the natural order Malvaceæ. The bark is very fibrous; and the fibre of *Urena lobata* and *Urena sinuata*, weeds common in most parts of India, is used as a substitute for flax in making cordage and paper stock. It is strong and fine and in many ways resembles jute, for which it is a good substitute. *Urena lobata* grows in various parts of the United States, particularly in Florida, where it has often been mistaken for ramie.

U'RETER (Gk. *οὐρητήρ*, *ourētēr*, ureter, urethra, from *οὖρον*, *ouron*, urine). One of two canals by which the urine is conveyed from the pelvis of the kidney (q.v.) on either side to the base of the bladder. Each ureter is about 18 inches in length, and enters the bladder in so slanting a direction as to prevent regurgitation. When a concretion is formed in the kidney, the ordinary and most favorable event is that it should descend through the ureter to the bladder. The passage of a stone through this tube gives rise to a series of violent symptoms, consisting of sudden and most severe pain, first in the loins and groin, subsequently in the testes (in the male) under the thigh; the testes may be retracted spasmodically. Coincident with the pain there are violent sickness, faintness, and collapse, which may last two or three days, and are only relieved when the stone reaches the bladder. The treatment consists in the warm bath, and the inhalation of chloroform or opium in large doses (both of which serve to allay spasm and deaden pain), and the free use of diluents to wash down the concretion. After the subsidence of the attack constitutional measures must be employed for the control of the existing diathesis.

URE'THANE (from *ur-ea* + *ethane* or *ethyl*). A useful unofficial hypnotic drug, chemically ethyl carbonate. It is made by the interaction of urea nitrate and ethyl alcohol. It occurs in colorless, odorless crystals with a slightly saline taste. It is readily soluble in water, alcohol, ether, or chloroform. A pure hypnotic, with no analgesic or depressing effect, it gives a quiet, natural sleep in from 15 to 45 minutes after its administration. It is also used as an antispasmodic in convulsive disorders, and in cases accompanied by coma may be given hypodermically.

URE'THRA (Lat., from Gk. *οὐρήθρα*, *ourēthra*, passage for urine, from *οὖρον*, *ouron*, urine). The canal by which the urine is discharged from the bladder. The male urethra is about nine inches long, and its office is to conduct the seminal fluid, secondarily to discharge the urine. It is divided into three parts: (1) the deep or prostatic urethra, which extends from the outlet of the bladder (with which it is continuous) through the prostate gland, being the part into which the seminal ducts open; (2) the membranous urethra, less than an inch long, extending from the prostate forward; and (3) the cavernous, or spongy, or penile urethra, extending through the erectile tissue to the end of the penis. The female urethra is less than two inches in length, and opens externally between the upper margin of the vaginal entrance and the clitoris. The urethra is lined by a continuation of the mucous membrane of the bladder, and in the male is extremely sensitive. See Gonorrhœa; Stricture.

URFAH, ụr-fä', or **ORFA**. The modern name for Edessa (q.v.).

URFAHR, o͞or'fär. A town in the Crownland of Upper Austria, on the left bank of the Danube, opposite Linz (q.v.), with which it is connected by an iron bridge. It manufactures spirits and machinery. Population, in 1900, 12,827.

URFÉ, ụr'fȧ', Honoré d' (1568-1625). A French pastoral romancer, born in Marseilles of noble family. Urfé was educated for the Church, but married his sister-in-law, Diane de Châteaumourand (1600). On the fall of the League he withdrew to Savoy and began to write in the pastoral style suggested by the Spanish *Amadis de Gaul*, which had been translated into French at the instigation of Francis I. (1540-48), and by the Greek pastoral romances which were rendered into French early in the sixteenth century. Fiction of this character had made a timid appearance in France before Urfé, for instance, in Fumée's *Du vray et parfait amour* (1599). It had already acquired its great masterpieces in Italy (Poliziano's *Orfea*, 1471 or 1472; Sannazaro's *Arcadia;* Tasso's *Aminta*, 1573; Guarini's *Pastor Fido*, 1590), in England (Spenser's *Shepherd's Calendar*, 1570), and in Spain (Montemayor's *Diana*, 1542; Gil Polo's *Diana Enamorada*, 1564, and Cervantes's *Galatea*, 1581). All these romances were popular in France, but Urfé's *Astrée* was the first that became a sort of social breviary for a generation. It is a novel of 5155 pages. Its first two volumes appeared in 1610, the third in 1619, the posthumous fourth and fifth in 1627, with other unofficial continuations. Of this interminable treatise on the verb *aimer*, Urfé borrows his pastoral scenes from the *Diana*, his warlike episodes from *Amadis*, and from the Greeks and Latins some episodes and much of his story-telling art; but he is superior to them all in character-drawing, in good humor, and in the higher social aim of his work. In the subtle differentiation of his lovers, Urfé is a not unworthy forerunner of Racine and Marivaux, unapproached by any novelist of his century but Madame de Lafayette. Urfé was a sort of realistic idealist; he chose the scene of his own birth, the banks of the Lignon, for the scene of his novel, and his conversations are lively, far beyond the wont of his time. His aim throughout is the refinement of society, and here its influence is hard to overestimate. The Hôtel de Rambouillet seems to have been organized in its imitation. *Astrée's* popularity was astounding. Bishops like Camus, saints like Francis de Sales, joined with realistic novelists like Sorel to sound the praise of this 'exquisite work.' La Fontaine, the scholarly Huet, the sprightly Fontanelle, the cynic La Rochefoucauld, all rejoiced in it. For two generations it was an accepted book of reference on deportment and breeding. In Germany, in 1624, a princely and aristocratic coterie, on organizing an *Académie des vrais amants*, assumed the names of the characters of the *Astrée*.

Consult: Bonafous, *Etude sur l'Astrée et sur H. d'Urfé* (Paris, 1846); Körting, *Geschichte des französischen Romans im 17ten Jahrhundert*, vol. i. (Oppeln, 1885).

URGA, o͝or'gȧ (Chin. *K'ulun*). The capital of Northern Mongolia, situated on the Tola River and the highway leading from Kiakhta (q.v.) to Peking, 175 miles south of Kiakhta (Map: China, C 2). It consists of the Mongolian town, inhabited mostly by lamas, and of the Chinese town, a few miles distant, where the Chinese and Russian merchants live. In the Mongolian town is situated the residence of the head of the Lamaist Church in Mongolia. There are also numerous temples surrounded by the houses of the lamas. In the Temple of Maidary is a colossal gilt statue of that divinity, over 33 feet high. During the religious festivals the town is visited by great numbers of pilgrims. Population, 30,000, including about 10,000 lamas.

URI, o͞o'rê. A canton of Switzerland, bounded by the Canton of Schwyz on the north, Glarus and Grisons on the east, Ticino on the south, and Valais and Unterwalden on the west (Map: Switzerland, C 2). Area, 415 square miles. The region consists of the narrow valley of the Reuss, surrounded by offshoots of the Bernese Alps on the west, the Glarus Alps on the east, and the Saint Gotthard group on the south. Many of the peaks exceed 10,000 feet. The climate is raw. Uri is primarily a pastoral canton, and exports chiefly dairy products. The principal manufactures are dynamite and parquet floors. The legislative authority is exercised directly by the people assembled in the Landsgemeinde. The canton is represented by one member in the Federal Council. Population, in 1900, 19,732, nearly all German-speaking Roman Catholics. Capital, Altdorf (q.v.).

Uri, first mentioned in 732, passed in the thirteenth century to the Hapsburgs. It gradually obtained its independence and in 1291 formed the 'perpetual league' with Schwyz and Unterwalden. In the fifteenth century the Val Leventina (now a part of Ticino) was acquired by Uri. The canton took part in the Sonderbund (q.v.).

URI. Another name for the Limpopo (q.v.), a river of South Africa.

U'RIAN, *Ger. pron.* o͞o'rê-än, SIR. A name, like the modern 'Mr. Blank,' once used to designate one whose real name was either unknown or unmentionable. It occasionally occurs in German and English literature before the nineteenth century, and is sometimes used of Satan. In Wolfram von Eschenbach's *Parzival* it is applied to the evil-minded Prince of Punturtois.

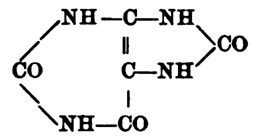
URIC ACID (from Gk. *οὖρον*, *ouron*, urine), $C_5H_4N_4O_3$. A compound of carbon, hydrogen, nitrogen, and oxygen, which forms a loose white powder or scales consisting of minute crystals devoid of smell or taste, only very slightly soluble in water (1 part requiring about 15,000 parts of cold and 1600 of boiling water), and quite insoluble in alcohol and ether. It is soluble without decomposition in strong sulphuric acid, and it may be thrown down from this solution by the addition of water. It is also soluble in the carbonates, borates, phosphates, lactates, and acetates of the alkalies, extracting from these salts a part of their base, with which it forms acid urates. Litmus paper is reddened by its moist crystals, or by a hot aqueous solution. The acid is not volatile, and by dry distillation is decomposed into carbonate of ammonia, urea, cyanuric acid, hydrocyanic acid, etc. Uric acid acts as a very weak dibasic acid, forming with bases two series of salts, the neutral and the acid, of which the former are the more soluble. Among the most important are the acid urates of sodium, potassium, lithium, and ammonium. The urate of lithium is more soluble than any other urate, and hence lithia water is an important therapeutic agent in converting uric acid and the more insoluble urates into a soluble salt in the living body. The urates are frequently called 'lithates,' and the acid itself 'lithic acid.'

Uric acid is widely distributed throughout the animal organism. It occurs not only in the urine of man and carnivorous animals, but is the chief constituent (either free or in combination) of many calculi occurring in the kidneys or bladder, and of numerous urinary sediments. The urinary secretion of birds and reptiles consists almost entirely of urates, which are also found in the excrements of caterpillars, butterflies, beetles, etc., and of many mollusks. Moreover, in very minute quantities, it occurs as a urate in healthy blood, in which fluid it has been found in excess in gout and Bright's disease, and is a constituent of the aqueous extract of the spleen, liver, lungs, pancreas, and brain. The *chalk-stones* occurring about the smaller joints and in the lobes of the ear of gouty patients consist mainly of urate of soda.

The best and most ready mode of obtaining uric acid on a large scale is from guano, or from the excrements of snakes or fowls, which consist largely of urates. For this purpose the mass is boiled with potash, which expels any ammonia that is present, and a stream of carbonic acid is then passed through the strained potash solution, which throws down acid urate of potash. This precipitate is dissolved in water, and decomposed by hydrochloric acid, which throws down the uric acid in minute crystals. The form in which this acid crystallizes is liable to great variations. Sometimes we have flat tablets resembling whetstones, or sections with a double knife through biconvex lenses; at other times, more or less perfect rhombic tablets, and sometimes hexagonal plates, barrel-shaped prisms, and toothed crystals. It is, however, difficult to identify uric acid crystals by direct inspection; so that, to prove the presence of uric acid, tests of a chemical nature must be applied. The so-called murexid reaction constitutes an excellent test: the substance submitted for examination is treated with a little strong nitric acid, and the mixture is evaporated to dryness at a gentle heat; the residue is moistened with a trace of ammonia, which, if uric acid was present in the original substance, produces a brilliant purple coloration; a drop of caustic soda changes the color to a reddish blue that disappears on warming the solution. The test is based on the fact that warming with nitric acid converts urea into purpuric acid, the acid ammonium salt of which—called murexid—has a brilliant reddish-purple color.

By the oxidation of uric acid two series of interesting products are obtained. If nitric acid is used as the oxidizing agent, uric acid splits up into urea and *alloxan* (a ureide). If, instead of nitric acid, potassium permanganate is employed, uric acid breaks up into carbonic acid and *allantoin* (another ureide). Alloxan can be readily transformed into parabanic acid (the ureide of oxalic acid), and from the latter urea and oxalic acid can be obtained with equal readiness. On the other hand, allantoin can be converted, by a series of simple reactions, into urea, allanturic acid (glyoxyl urea), parabanic acid (oxalyl urea), and hydantoic acid, the latter being closely allied to hydantoin (glycolyl urea). The substituted ureas (ureides) obtained from uric acid may also be prepared directly from urea. (See UREAS, COMPOUND.) It is, therefore, clear that uric acid and urea are chemically closely related to each other. In mammals nitrogenous substances are disintegrated mainly into urea; in birds the main product of disintegration is uric acid. The formation of both urea and uric acid takes place most probably in the liver. The urine of mammals sometimes contains allantoin, hydrated parabanic acid, oxalic acid, and other products, which are obtained in the laboratory by oxidizing uric acid.

The products of decomposition of uric acid were first thoroughly investigated, in a series of celebrated researches, by Liebig and Wöhler. Then the chemical relationship of urea and uric acid was clearly established. It has since been shown that uric acid is a di-ureide, i.e. a substitution product containing two molecules of urea. After much painstaking research, carried on by some of the best chemists of the century, it was possible to demonstrate the true chemical constitution of uric acid, and finally Horbaczewsky succeeded in preparing this important organic substance by a synthetic method; Behrend and Roosen subsequently discovered another synthesis of uric acid, which is relatively simple and perfectly well understood in the light of our knowledge of the constitution of uric acid. The chemical constitution of uric acid is represented by the following structural formula, first proposed by Medicus:



Uric acid.

URICO'NIUM, or **VIR'ICO'NIUM.** An ancient Roman city of Britain, the site of which is about four miles to the east of Shrewsbury, and partly occupied by the village of Wroxeter. It is mentioned by Ptolemy as existing in the beginning of the second century of our era, and it is probable that there was a Roman station here before A.D. 70. The traces of the ancient wall show that it had a circumference of about three miles, and through it ran the great Roman road now known as Watling Street. Exploration of the remains began in 1859. On the north side of the old wall was probably the Basilica, and on the south the public baths. A few inscriptions and numerous small objects, such as coins, brooches, hairpins, pottery, sculptures, etc., found in the ruins are in the museum at Shrewsbury, and some of the buildings excavated have since been covered. The human remains found in the excavations show that the city was sacked and burned by enemies, probably the West Saxons, in the sixth century. Of this, however, there is no historic record. The ruins seem to have remained with little change, except the gradual process of decay, till about the twelfth century, when they were used as material for other buildings. Consult J. C. Anderson, *The Roman City of Uriconium at Wroxeter* (London, 1867).

URIEL (Heb. *Ūriēl*, Light of God). One of the seven archangels, who personified light and had his dwelling in the sun. He appears in Milton's *Paradise Lost* and Longfellow's *Golden Legend*.

U'RIM AND THUM'MIM (Heb. *ûrîm wĕtummîm*). The name given to two objects, perhaps pebbles or stones in the shape of dice, kept in the oracle-pouch that hung upon the breast of the Jewish high priest (Ex. xxviii. 30; see EPHOD). They were used to obtain an oracular decision revealing the Divine will. While we do not know the precise manner in which this decision was obtained, analogy from similar customs among ancient nations makes it probable that the stones were drawn by lot out of the pouch, and, according to the one drawn, an affirmative or negative answer to a question was given. An entirely satisfactory explanation of the two mysterious names has not yet been furnished, but all the evidence points in favor of a connection with two Babylonian stems (*u'uru* and *tamu*), from which are derived *urtu*, 'decision' (used chiefly of oracular decisions), and *tamitu*, 'oracle,' which occur in the religious literature of Babylonia. The two words would thus be almost synonymous, and this view is supported by the consideration that they are so used in the Old Testament (e.g. Deut. xxxiii. 8, according to the Septuagint text), and that Urim at times is used without Thummim (e.g. Num. xxvii. 21 and I. Sam. xxviii. 6), which shows that the one word conveyed the idea without the help of the other. The early explanations, such as 'light and perfection' or 'light and truth' (Luther's view), are generally rejected as purely fanciful by critical scholars, who hold that the use of the Urim and Thummim belongs to the realm of primitive religious rites, and that its persistence to so late a period as that of the compilation of the Priestly Code (Ex. xxviii. 30) is due to the strong hold that it had taken upon the Hebrews. It should be added, however, that the notice in the Priestly Code, where the Urim and Thummim are described as a part of the high priest's costume, without reference to their practical use, marks the transition to the symbolical view taken in the later Jewish theology of their significance as tokens of the revelation and guidance granted to Israel through its representative, Aaron. Consult the articles in the Hastings *Bible Dictionary* and the *Encyclopædia Biblica*, and Muss-Arnolt, "The Urim and Thummim," in the *American Journal of Semitic Languages*, vol. xvi. (Chicago, 1900).

URINE (Lat. *urina*, urine; connected with Gk. *οὖρον*, *ouron*, urine, Skt. *vāri*, *vār*, water, Av. *vāra*, rain, Icel. *ūr*, drizzling rain, AS. *wær*, sea). The fluid which is secreted by the kidneys, stored in the bladder, and evacuated through the urethra in the act of micturition. The epithelium lining the tubules of the kidneys elaborates from the blood urea and other products of retrograde metamorphosis, and a transudation or osmosis of water occurs from the interior of the convoluted blood vessels into the cavity of the tubules.

In a healthy human being, urine is a clear yellowish or amber fluid of a salty taste and a peculiar aromatic odor, normally acid, and with a specific gravity of about 1.020, and generally containing some mucus. In 24 hours such a person discharges about 50 fluid ounces, or 1500 cubic centimeters, of urine. The amount of the several urinary constituents passed in 24 hours are as follows, according to Parkes:

	Grams
Water	1500.000
Total solids	72.000
Urea	33.180
Uric acid	0.555
Hippuric acid	0.400
Kreatinin	0.910
Pigment and other substances	10.000
Sulphuric acid	2.012
Phosphoric acid	3.164
Chlorine	7.000
Ammonia	0.770
Potassium	2.500
Sodium	11.090
Calcium	0.260
Magnesium	0.207

These constituents, other than water, appear in the urine as: (1) inorganic salts, including sodium chloride; calcium chloride; potassium and sodium sulphates; sodium, calcium, and magnesium phosphates; traces of silicates; alkaline carbonates; nitrates in small quantity; traces of iron. (2) Nitrogenous crystalline bodies, including urea, uric acid, kreatinin, xanthin, hypoxanthin, and occasionally allantoin; hippuric acid, ammonium oxalate; and rarely taurin, cystin, leucin, and tyrosin. (3) Non-nitrogenous bodies, including lactic, succinic, formic, oxalic, and phenylic acids; and rarely sugar in minute amount. (4) Pigments, including urobilin, purpurin, and indican. (5) Other bodies, including ferments from the various digestive fluids of the body. (6) Gases, rarely, in very small quantities, chiefly nitrogen and carbonic acid.

The acidity of normal urine is due to the presence of the acid sodium biphosphate. At times the urine of digestion is alkaline, and frequently urine decomposes rapidly and becomes alkaline. Upon standing and cooling, it frequently becomes cloudy from the urates, and a sediment of pink urates occurs; or in other cases an increase of oxalate of ammonium, together with mucus, forms a thick precipitate or deposit. This occurrence by no means indicates disease of the kidneys, as is claimed by ignorant quacks. Among the abnormal constituents of urine are blood, pus, epithelium from bladder, kidney, ureter or vagina, spermatozoa, albumin, fibrin in the form of 'casts,' fats, sugar, etc., during various conditions or diseases. In Bright's disease (q.v.) albumin and casts are generally found.

Urea is determined most easily by a test with hypobromate of potassium. The total excretion per day should be between 300 and 600 grains. Uric acid generally precipitates in a few days if the urine be allowed to stand. It may be determined by a hydrochloric acid procedure. Sugar is generally detected by using a solution of sulphate copper, which is reduced and precipitated in the form of the orange-colored oxide in the presence of glucose. Albumin responds to boiling or the nitric acid test, either of which causes a permanent cloud in the urine if albumin be present. Phosphates cause a white cloud on boiling the urine, which is dissolved and cleared away by adding a drop of acetic acid. Chlorides, ammonia, and urates have their special chemical tests.

THE URINARY DEPOSITS are of rare beauty and interest under the microscope. Besides blood, pus, and epithelial cells occurring during grave illness, several crystals are found in ordinary urine with slight variations in health. After standing for a time at a moderate temperature, amorphous granular matter precipitates in most urine, soluble by heat, and composed of the urates of calcium and magnesium with the acid urates of potassium, sodium, and ammonium. These deposits are probably caused by the excess of phosphoric acid furnished by the acid sodium biphosphate, which decomposes the alkaline urates. After a longer period, of a few days to two weeks, alkaline fermentation supervenes, due to the presence of yeast fungus and mucus. During this process urea is converted into carbonate of ammonium. As this fermentation begins, the uric acid crystals, occurring as red pepper dust in the receptacle, begin to dissolve, while adhering to their fragments we find prismatic crystals of urate of sodium and spheroids of urate of ammonium. When the alkalinity of the urine is established amorphous granules of phosphate of lime appear, together with triangular prisms of triple phosphates of ammonium and magnesium, and octahedral crystals of oxalate of calcium.

These changes may progress in the pelvis of the kidney or in the bladder. Uric acid gravel or calculus is found in either situation, causing much pain and a grave pathological condition, as the changes in the mucous membrane lining either cavity are important. (See CALCULUS.) Uric acid or urate calculi are generally red and quite hard. Oxalate calculi are usually found, when present, in the pelvis of the kidney, and are of such shape and color as to be called 'mulberry' calculi. Phosphatic calculi are white and soft, and often appear as dust. Calcium carbonate, cystin, and xanthin calculi are rare. Calculi may be prevented, and probably phosphatic calculi may be dissolved in the bladder by the use of lithia waters or salicylates. They cause severe inflammatory conditions in most cases. See LITHIC ACID DIATHESIS; PHOSPHATIC DIATHESIS. See MICROSCOPY, CLINICAL, and accompanying illustrations. Consult Ogden, *On the Urine* (Philadelphia, 1901).

URINE, INCONTINENCE OF, or ENURESIS. A troublesome affection, far more common in childhood than in more advanced life. The child is in the habit of discharging its urine in bed during sleep. The habit may often be broken by proper domestic management, as withholding any excess of fluids before going to bed, and by waking it and making it discharge the contents of the bladder late at night. The most certain medicinal remedy is belladonna, given under a physician's advice. The various forms of mechanical pressure that have been suggested, with the view of preventing the passage of the urine, cannot be too strongly condemned. Incontinence of urine consists of an easily excited and frequently repeated reflex micturition. It is seen in some cases of cerebral or spinal disease, when it is of a different nature. In these cases the bladder becomes filled, and subsequently formed urine dribbles away, owing to a failure in the nerve mechanism to cause contraction of the muscle fibres in the wall of the viscus.

URINE, RETENTION OF. See RETENTION OF URINE.

U′RIYA LANGUAGE AND LITERATURE (Skt. *Odra, Utkali*). The language and literature of Orissa (q.v.), in Bengal, spoken by about 9,000,000 persons. Like the other modern Aryan languages of India, it is analytic in structure. It seems to be descended from the Utkali or Odra dialect of Prākrit (q.v.). In general Uriya is related to Bengali (see BENGALI LANGUAGE AND LITERATURE), although it resembles Hindi. (See HINDUSTANI LANGUAGE AND LITERATURE.) The vocabulary is largely composed of Sanskrit loan-words, of which Uriya possesses more than any other of its kindred languages. There are no important dialectic divisions. The standard dialect is that of Cuttack. The script, which is derived from the Devanagari (q.v.), is graceful, and noteworthy among the North Indian alphabets in that it is characterized by curves instead of angles. Uriya literature cannot be traced before the sixteenth century. It begins with Upendro Bhanj, the author of more than thirty poems, most of them religious or erotic, although he also wrote two dictionaries. Contemporary with him was Dinkrishno Das, who composed the most famous Uriya poem, the *Rasakallōḷa* (edited at Cuttack, 1897). Most of the literature, however, consists of translations or paraphrases of Sanskrit works, such as the *Rāmāyaṇa* (q.v.), the *Bhagavadgita* (q.v.), and some of the *Purāṇas* (q.v.), while in later times the tendency has been to translate or adapt Bengali and English books. Consult: Beames, *Comparative Grammar of the Modern Aryan Languages of India* (3 vols., London, 1872-79); Cust, *Modern Languages of the East Indies* (ib., 1878); Sutton, *Introductory Grammar of the Oriya Language* (Calcutta, 1831); Anon., *The First Lesson in Oriya* (Cuttack, 1844); Visvanath Misra, *Easy Guide to Uriya Translation* (ib., 1899); Jagannath Rao, *Utkal Abhidhán: A Dictionary of the Uriya Language* (ib., 1891); Chakravarti, "Notes on the Language and Literature of Orissa," in the *Journal of the Royal Asiatic Society, Bengal Branch*, vols. lxvi.-lxvii. (Calcutta, 1900).

URLICHS, o͞or′liks, LUDWIG VON (1813-89). A German archæologist, born in Osnabrück and educated at Bonn. He taught at Bonn from 1844 to 1847, was then called to Greifswald and in 1855 to Würzburg. He wrote on the history of art, *Skopas' Leben und Werke* (1863), *Die Anfänge der griechischen Künstlergeschichte* (1871-72), and *Beiträge zur Kunstgeschichte* (1885); and on Tacitus and Pliny. His "Grundlegung und Geschichte der klassischen Altertumswissenschaft" (1886; 2d ed. 1892), in Iwan Müller's *Handbuch*, is his most important work in classical philology.

URMIA, o͞or-mē′ȧ. A lake and city of Persia. See URUMIAH.

UROCHORDA, ū′rō-kôr′dȧ (Neo-Lat. nom. pl., from Gk. *οὐρά*, *oura*, tail + *χορδή*, *chordē*, chord). A class of chordate animals, the ascidians (q.v.).

U′RODE′LA (Neo-Lat. nom. pl., from Gk. *οὐρά*, *oura*, tail + *δῆλος*, *dēlos*, manifest). An order of the Amphibia which comprises the tailed amphibians, or amphiumes, salamanders, and mud-puppies (qq.v.), in which both fore and hind limbs are always present, and which have teeth in both jaws; and the sirens, in which the hind limbs, maxillary bones, teeth, and eyelids are absent. This order is confined to the north temperate zone, except a few forms that extend along the highlands into Venezuela. About 100 species in seven families constitute the entire list. The geological origin of the group is uncertain; representatives are numerous in the Lower Tertiary strata; and a single Mesozoic specimen is known. Consult Gadow, *Amphibia and Reptiles* (London, 1902).

URQUHART, ĕr′kĕrt, DAVID (1805-77). A British diplomat and political writer. He was born in Scotland, and was educated at Saint John's College, Oxford. In 1835-36 he was secretary of legation at Constantinople. Because of opposition to the Eastern policy of Lord Palmerston, whom he suspected of collusion with the Czar, he resigned his position. After traveling in all parts of the East to obtain further information respecting the commercial and political influence of Russia, he returned to England, and both in his writings and in Parliament (1847-52) openly charged the Palmerston Ministry with betrayal of British interests. His publications include:

Turkey and Its Resources (1833); *The Spirit of the East* (1838); *The Mystery of the Danube* (1844); *Letters and Essays on Russian Aggressions* (1853); and other books bearing on the Eastern question.

URQUHART, or **URCHARD**, Sir THOMAS (1611-60). An English author. He belonged to an ancient family of Cromarty in Scotland. He was educated at King's College, Aberdeen, and traveled in France, Spain, and Italy. He was on the Royalist side in the Revolution; was knighted by Charles I. in 1641; and fought at the battle of Worcester. He was taken prisoner and was imprisoned in the Tower and then in Windsor Castle, but was soon released on parole. Of his last years little is known. He is said to have died abroad in an uncontrollable fit of laughter on the restoration of Charles II. He is still known for his excellent translation of Rabelais (two books of *Gargantua* in two vols., 1653; reissued with the continuation by P. A. Motteux in Bohn's Library, London, 1897, and in Tudor Translations series, London, 1899). Of great interest is *The Jewel*, in which is described a universal language (1652). In his *Promptuary of Time* (1652) he traced his family back to the red earth from which God created Adam. He also published *Epigrams, Divine and Moral* (1641); *The Trissotetras; or a most Exquisite Table for Resolving all manner of Triangles*, and other curious books.

URQUIZA, ōōr-kē'thȧ, JUSTO JOSÉ (1800-70). A South American soldier and politician, born at Arroyo de la China, Entre Rios, Argentina. He was educated by the Jesuits and attained great prominence in his native province as an adherent of the Federal Party. In 1844-45 he fought with sanguinary distinction in Uruguay, and in 1846 was elected Governor of Entre Rios, attaining soon to dictatorial power, and devoting his energies largely to his own enrichment. In 1851 he took the field against Rosas (q.v.), the dictator of Buenos Ayres, whose ambition was directed against the autonomy of the other Argentine States, formed an alliance with Brazil and Uruguay, and entering the latter country in June, forced Oribe, the general of Rosas, to capitulate. Urquiza then crossed into Buenos Ayres, and at Monte Caseros, February 3, 1852, defeated Rosas, who was compelled to flee. In 1853 he was elected President of the Argentine Confederation, which included all the States excepting Buenos Ayres, and by his victory at Cepeda, October 23, 1859, forced that State, too, to lend its adhesion. His term of office ended in the same year. Very soon afterwards Buenos Ayres revolted, and Urquiza, at the head of the forces of the Confederation, was defeated by General Mitré at Pavón, September 17, 1861. He subsequently became Governor of Entre Rios. He was assassinated by political enemies on his estate at San José, near Concepción.

UR'SA MA'JOR (Lat., greater bear) AND **UR'SA MI'NOR** (Lat., lesser bear). Two celebrated constellations in the northern hemisphere of the heavens. Ursa Major was distinguished as early as the time of Homer by the names *Arktos*, 'the Bear,' and '*Hamaxa*,' 'the Wagon.' The Roman name *Ursa* was a translation of the Greek *Arktos;* the Romans also called the seven bright stars the *Septentriones*, 'the seven plowing oxen.' The common names throughout Europe for these seven stars are the 'Plow,' 'Charles's Wain,' the 'Wagon,' evidently derived from the classical epithets above mentioned, and the 'Dipper,' from the resemblance to that utensil. The remarkable group of stars in the hinder part of the Great Bear, being within 40° of the North Pole, never sinks below the horizon of any place in a higher northern latitude than 40°. It contains a considerable number of stars, many of which are easily visible by the naked eye; but of these, only one (α) is of the first magnitude, two (β and γ) of the second, and eight (among which are δ, ϵ, ζ, and η) of the third. Of the seven stars constituting the 'Dipper,' α and β are known as the 'Pointers,' because a line drawn through them points directly at the *pole-star* (q.v.).

Ursa Minor is less prominent in the heavens. The star α in the extremity of the tail of the Little Bear, at present the pole-star (q.v.), is the brightest in the constellation, though only of the second magnitude.

URSIDÆ. The family of the bears (q.v.).

URSI'NUS, *Ger. pron.* ōōr-sē'nṳs (Latinized translation of his German name Bär), ZACHARIAS (1534-83). A Reformed theologian. He was born at Breslau, and studied at Wittenberg under Melanchthon, at Geneva under Calvin, and at Paris. He became professor at Heidelberg 1561, and teacher at Neustadt-on-the-Hardt in 1578. With Olevianus he drew up the Heidelberg Catechism, and wrote in its defense. His collected works appeared at Heidelberg in 3 vols. (1612 et seq.) Consult Sudhoff, *Olevianus und Ursinus* (Elberfeld, 1857).

URSO, ṳr'sō', CAMILLA (1842-1902). A French violinist, born at Nantes, France. She studied with Massart in Paris, and, about 1852, played in New York, Boston, Philadelphia, and other American cities. She was most successful, especially in concerts with Alboni and Sontag. She returned to France after having toured Canada, and in 1866 returned to New York.

URSUA, ōōr-sōō'ȧ, or **ORSUA**, PEDRO (c.1510-61). A Spanish soldier and explorer in South America, born in Ursua, near Pamplona, Navarre. About 1544 he went to New Granada, where he became Governor in 1545, and in 1547 and again in 1549 marched to the northeast in search of Eldorado, making several settlements, among them Pamplona. In 1559 he was sent by the Viceroy of Peru to search for Eldorado or the Kingdom of the Omaguas, on the southern Amazon, or more probably to rid the country of the many soldiers of fortune then in Peru. These enlisted eagerly, and one of them, Lope de Aguirre (q.v.), after the expedition had sailed down the Moyobamba and the Huallaga, formed a conspiracy, the outcome of which was the assassination of Pedro.

UR'SULA, SAINT. A saint and martyr of the Roman Catholic Church. She is held in especial reverence at Cologne, the reputed place of her martyrdom. October 21st is her day in the Church's calendar, and the date of her martyrdom is variously given as 237, 283, and 451. The official date, however, is 237. According to the simplest form of the legend, Ursula was the daughter of a British king, Deonatus. She was called Ursula from Ursa, 'bear'—signifying that she was intended to kill the bear, i.e. the devil. Her hand was asked in marriage by a "certain most ferocious tyrant," for his son. The tyrant threatened to sack the country if his suit were not granted. Ursula, in consequence of a vision, in which she was shown her future martyrdom, asked for a respite of three years, during which time she with ten chosen maidens, each with 1000 attendants, should visit shrines and holy places to honor their virginity. Another condition was that her betrothed, Ætherius, should become a Christian. This large company of virgins set sail, and with a favoring breeze were carried to Thiel in Guelderland, on the Waal. Thence they sailed on the Rhine by way of Cologne to Basel, where they left their ships and proceeded overland on foot to Rome. Returning to Basel, they embarked on their ships, only to be attacked by Huns at Cologne and slaughtered. They were buried by the inhabitants of Cologne with great honors, and a church was built over their remains. A late addition to the story says that Attila wished to reserve Ursula for himself. Upon her indignant refusal, he became enraged and shot her through the breast with his arrows.

The controversy over this legend has continued for many hundred years. The conservative element in the Roman Catholic Church considers it probable that there was at one time a massacre of virgins at Cologne by the Huns, but that the details of the story as given at the present time are mediæval fabrications. The rationalists outside of the Church follow Schade's theory that the story of Ursula is only a Christianizing of an old German myth, and that Ursula is really Freya, called in Swabia 'Hörsel,' with the same attributes as the moon divinities in other lands. Still another solution is that one of Ursula's companions was named Undecimilla, which might easily be read *undecim milia* (eleven thousand).

Bibliography. Consult: Crombach, *Vita et Martyrium Sanctæ Ursulæ et Sociarum* (Cologne, 1547); Schade, *Die Sage von der heiligen Ursule und den elftausend Jungfrauen* (Hanover, 1854). For controversial replies to Schade: De Buck, *Acta Sanctorum* (Brussels, 1858); Kessel, *Ursula und ihre Gesellschaft* (Cologne, 1863).

URSULINES. A religious Order for women in the Roman Catholic Church, particularly devoted to the education of girls. They take their origin from Saint Angela Merici (q.v.). A rule, in twenty-five chapters, was projected by Angela, and finally approved (1536) by the Bishop of Brescia, Cardinal Francis Cornaro. Angela was herself chosen as the first superior, in the year 1537, the community even at that time numbering as many as seventy-six sisters. In the year 1565 a house was opened at Cremona; and with the approval of Popes Gregory XIII. and Clement VIII., it was spread over many dioceses of Italy. It was warmly encouraged by Saint Charles Borromeo, and at his death there were no fewer than eighteen convents of the Order in his diocese, comprising above 600 nuns. Soon afterwards it was established in France (1584). They were introduced into Savoy by Saint Francis de Sales in 1635; and in 1639 a convent was opened in Quebec. About the same time they were introduced into Germany—at Vienna, in 1660, and at Freiburg, Kitzingen, and Prague soon afterwards—where they have continued to teach with great success. They now number 300 convents and 7,000 nuns and are found in all parts of the world. The Ursuline Sisters have several educational establishments in Ireland, in England, Scotland, Canada, and twenty-four in the United States with thousands of pupils. Consult: Postel, *Histoire de Sainte Angèle Merici et de tout l'ordre des Ursulines* (Paris, 1878); Sainte-Foi, *Annales de l'ordre de Sainte Ursule* (Clermont-Ferrand, 1858); *Les Ursulines de Québec* (Quebec, 1868).

URTICACEÆ (Neo-Lat. nom. pl., from Lat. *urtica*, nettle, from *urere*, Skt. *uṣ*, to burn). A natural order of about 40 genera and 450 species of dicotyledonous under-shrubs and herbs, natives of almost all parts of the world. Some species furnish valuable fibres. The chief genera in the order as restricted are: Urtica, Urena, Laportea, Pilea, Bœhmeria, Maoutia, and Parietaria. See Bœhmeria; Nettle.

URTICARIA (Neo-Lat., from Lat. *urtica*, nettle), Hives, or Nettle Rash. An eruption of the skin, coming out quite suddenly, and consisting of firm, round, convex, or lenticular elevations of the skin, from a quarter of an inch to an inch in diameter, at first pink, and soon becoming white in the centre. These are called pomphi or wheals. They are scattered or closely crowded over the part affected, and are not symmetrical. In the acute form of the disorder the wheals arise rapidly and subside in a few hours or a day at longest. In the chronic form they last longer and recur frequently. Urticaria is accompanied with intense itching.

The causes may be both local and general. Among the local causes are direct irritants such as the poison of the stinging nettle (whence the name), the stings of bees and wasps, contact with jellyfish and certain caterpillars. A popular form of urticaria is due to the bites of fleas and bugs. General or systemic causes may be the eating of shellfish, pork, sausages, mushrooms and some fruits, such as strawberries; certain drugs, as copaiba, cubebs, quinine; general disorders, such as gout, indigestion, asthma, and in women pregnancy, menstruation, and lactation. Sometimes no cause can be found except general nervous irritability. Treatment must depend on the cause, which should be sought for and removed. Acute cases, due to articles of diet, may be relieved by an emetic, if vomiting and diarrhœa do not occur spontaneously. In the chronic form, which is often very stubborn, if the urticaria can be traced to any article of food, this should be eliminated. The digestion must be regulated, and general disorders, such as gout, treated with appropriate remedies. For the severe itching a burning alkaline bath or lotions, or mild solutions of carbolic acid or other antiseptics, may be used locally. Scratching must be avoided, since it only aggravates the affection. Where the hives are the result of nervous irritability the general health must be built up.

U'RUBITIN'GA (from Braz. *urubu*, vulture + Tupi *tinga*, white, beautiful). A large hawk of the genus Urubitinga, several species of which exist in tropical America. All have bluish black plumage, marked with white on the rump and tail. One species, the Mexican black hawk (*Uru-*

bitinga anthracina), may be found in Arizona. These hawks nest in large trees, and lay white eggs.

URUGUAY, *Sp. pron.* o͞o'ro͞o-gwī'. A river of South America. It rises on the west slope of the Brazilian Coast Range, and flows first westward on the boundary between the States of Santa Catharina and Rio Grande do Sul, then southwest between the latter State and Argentina, and finally southward between Argentina and Uruguay, emptying into the Plata estuary (Map: America, South, D 5). Its total length is about 1000 miles. The greater part of its course lies on the plateau, and the upper portion, known as the Pelotas, passes through a densely forested wilderness. The banks are generally high as far as Salto, 200 miles from the mouth of the river, and at that point navigation is obstructed by a series of rocky reefs and rapids, which become falls at low water. Below Salto the land on the western bank is low and level, and periodically inundated. The Uruguay here connects by lateral branches with the Paraná. For the last 100 miles the river is very broad, and really forms the head of the Plata estuary, though the name Uruguay is continued to the Paraná confluence. The river is navigable for large sea-going vessels to Paysandú, about 150 miles, and for smaller vessels to Salto, while barges navigate the stream 300 miles above the rapids.

URUGUAY. The smallest of the South American republics, bounded on the north by Brazil, on the east by Brazil and the Atlantic Ocean, on the south by the Atlantic Ocean and the Rio de la Plata, and on the west by the Uruguay River, the boundary line between Uruguay and Argentina. Its area, including some small islands off the coast and in the Plata, is 72,151 square miles.

TOPOGRAPHY AND MINERALS. The most elevated portions of Uruguay lie in the north and northwest, where a few sharp ridges attain a height of nearly 2000 feet. Along the Uruguay River are found table lands of moderate elevation, resembling the neighboring pampas of Argentina, though higher. The southeastern coast portion is low and marshy, with sandy stretches bordering the ocean, while the interior is composed of rolling plains diversified in the north and northwest by low ridges of hills. Here extensive forest regions also occur, especially near the rivers; while the southeastern portion is largely covered with grass. The hills rest upon an old crystalline foundation of gneiss and granite, with some sandstone, Tertiary and ancient eruptive rocks, and possibly Paleozoic strata. The maritime and river coast of Uruguay from Chuy to Santa Rosa is 685 miles long. After the Rio de la Plata and the Uruguay the Rio Negro, wholly within the republic, is the most important river, and for a portion of its course is navigable for small craft. On the northeastern frontier Lake Mirim, though belonging entirely to Brazil, affords an outlet to the surrounding district. But little advantage has been taken of the mineral wealth of the country, though it is certain that iron, zinc, lead, sulphur, antimony, and coal exist, and profitable gold washings. Marble and other building stone quarries are in operation, and some precious stones are sent abroad.

CLIMATE, FLORA, AND FAUNA. The almost peninsular position of Uruguay gives it a delightful climate, with temperature ranging from 32° to 88° F. Occasionally in the lowlands the temperature rises to 100° in February, while frosts are common in the upland regions, where occasional snows also occur at long intervals. Rains are plentiful throughout the year, but the greatest precipitation occurs in May and in October. During the winter months cold storms, known as *pamperos*, blow from the southwest. In its flora and fauna Uruguay in the northern part resembles Southern Brazil, and in the southern part its neighbor Argentina. See ARGENTINA and BRAZIL.

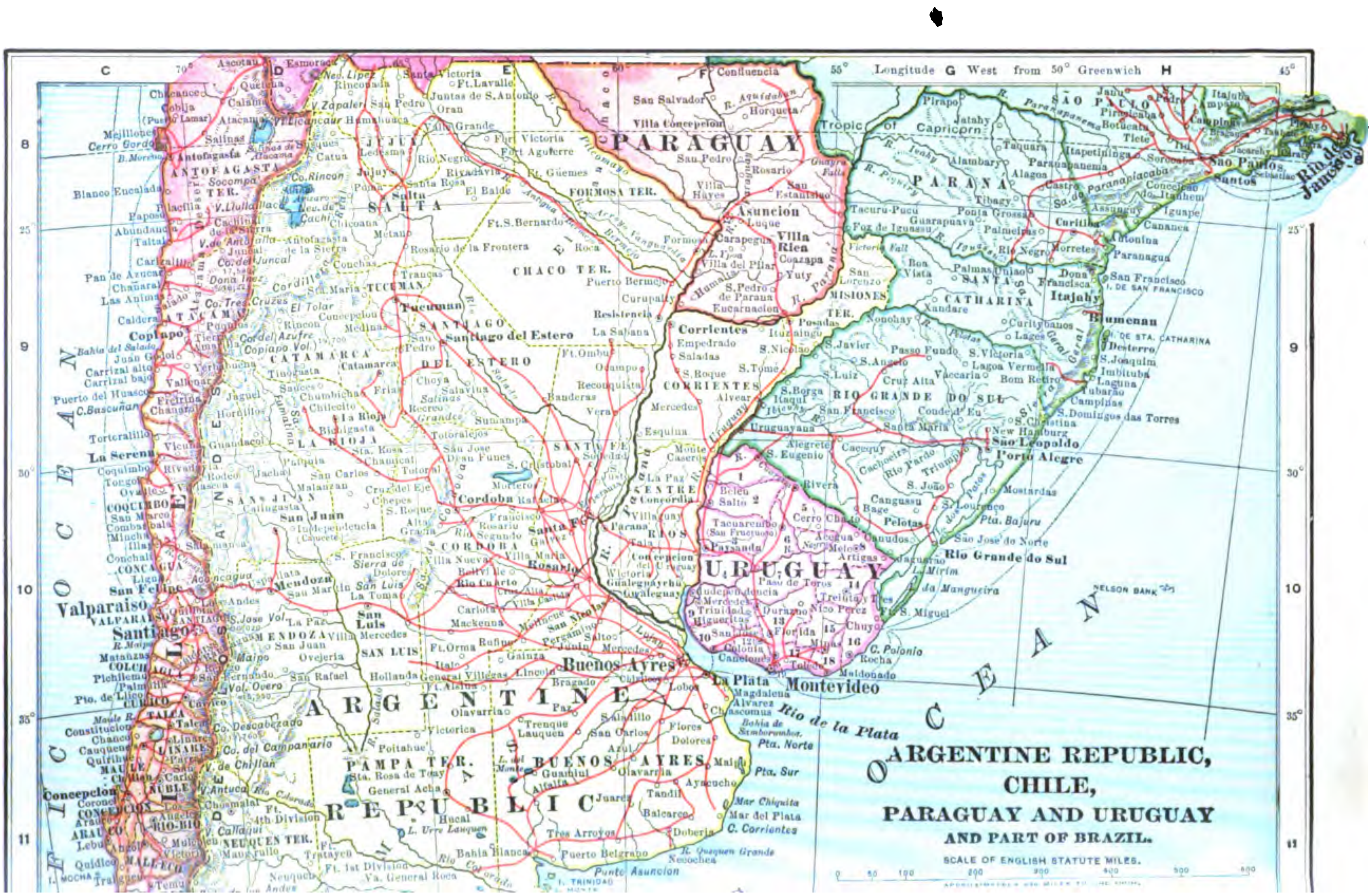
INDUSTRIES. During recent years there has been a steady advance in agricultural production. Public companies facilitate the purchase of land by settlers. Up to 1880 most of the breadstuffs were imported, but since 1885 corn and wheat have become important articles of export. About 1,400,000 acres are in cultivation, of which 750,000 are in wheat. The grazing industries of Uruguay are, however, the chief reliance of the inhabitants. In 1901, 6,326,601 head of cattle were reported. The sheep industry is likewise of growing importance. In 1901 the number of sheep was reported as 17,624,548, and the exports of wool for 1900, 26,755 tons. The chief manufacture is flour. There are *saladeros* for the production of jerked and salted meats for foreign shipment, and the Liebig Company establishment has a branch at Independencia for the manufacture of beef extracts. In the season of 1900 these industries slaughtered 698,900 cattle. In 1901 there were 575,361 horses in the country. On an average about 70,000 grams of gold are extracted annually. The gold mines are in the northern region.

TRANSPORTATION AND COMMERCE. In 1901 the railway mileage of the Republic was 1210 miles, 602 of which bore a Government guarantee of 3½ per cent. on the capital involved in its construction. The rivers are largely utilized for inland communication, and in addition there are some 2250 miles of national highways and 3100 miles of departmental roads and paths for local traffic. In 1901 the twenty-five Uruguayan steamers had a net tonnage of 10,037. For foreign tonnage, see MONTEVIDEO, which is the chief port, and, owing to its recent improvements, one of the best on the coast. The value of the special foreign trade in merchandise is as follows:

	1897	1899	1901
Imports	$19,512,216	$25,652,788	$23,691,932
Exports	29,319,573	36,574,164	27,731,126

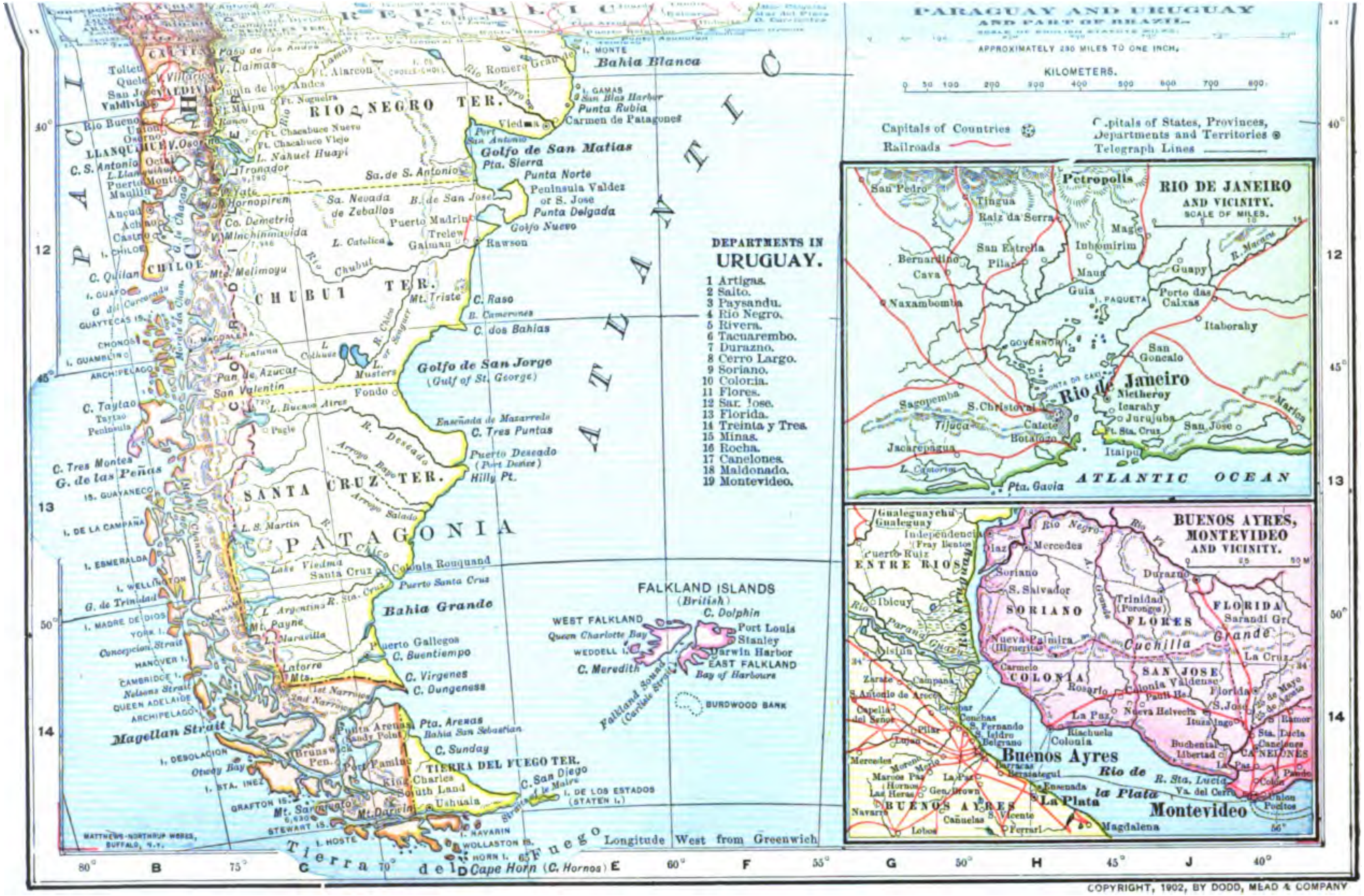
The leading imports include foodstuffs, textiles, machinery, ironware, and jute; the exports, preserved meats, hides and horns, tallow, cattle, beef extracts, and agricultural products.

GOVERNMENT. The Constitution dates from July 18, 1830. The legislative department consists of a Senate, composed of one member from each of the nineteen departments, and of a Chamber of Deputies composed of 69 members — one for every 3000 voters. The executive power is vested in a President, chosen by a majority vote of the Assembly in joint session, for a term



ARGENTINE REPUBLIC, CHILE, PARAGUAY AND URUGUAY AND PART OF BRAZIL.

SCALE OF ENGLISH STATUTE MILES.



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY

of four years, and assisted by a Cabinet of five members, and in a Vice-President, who acts as the presiding officer of the Senate. Each territorial department is ruled by an executive, appointed by the President, and an administrative council, chosen by popular election. The supreme judicial power is vested in national courts of appeal, of which there are three for civil cases, two for commercial cases, and one for treasury cases. Montevideo (q.v.) is the capital.

FINANCE. In 1890 the Republic suffered from a financial panic which caused a great falling off in the revenue. The statistics for expenditure are not available, but the revenues for 1897-98 were reported to amount to $16,271,298, and for 1900-01, to $17,902,599. The larger portion is derived from customs, the sum being estimated at $10,000,000 for 1901-02. The budget for 1901-02 (estimated) balanced at $16,161,000. More than half the expenditures are for national obligations; $2,300,000 were set off for the Ministry Government. The foreign debt in 1902 was about $100,000,000. The internal debt is about one-fifth of this amount. The monetary standard is gold, and the peso, valued at $1.034, is the unit of exchange. There are no national gold coins in circulation, but foreign coins take their place. The Bank of the Republic, established in 1896 with a capital of $10,000,000, has the right to issue bank notes, redeemable in gold or silver, to the value of half its stock.

For ARMY and NAVY, see articles ARMIES and NAVIES.

POPULATION. The population was estimated as follows, in 1901, the table including a list of the departments with their areas:

DEPARTMENTS	Area, square miles	Population
Artigas	4,392	27,001
Canelones	1,833	86,735
Cerro-Largo	5,765	37,236
Durazno	5,525	38,111
Flores	1,745	16,180
Florida	4,675	45,248
La Colonia	2,195	51,563
Maldonado	1,590	27,035
Minas	4,795	37,152
Montevideo	256	273,665
Paysandú	5,115	44,411
Rio Negro	3,270	23,127
Rivera	3,795	25,349
Rocha	4,280	30,428
Salto	4,865	45,754
San José	2,690	42,181
Soriano	3,565	38,851
Tacuarembó	8,115	38,789
Treinta y Tres	3,685	25,800
Total	72,151	954,616

The foreigners numbered 97,415, chiefly from Brazil, Italy, Spain, and Argentina. The natives show a greater admixture than is the case with those of Argentina, and are very conservative, especially in the north, where there is a large Brazilian element.

EDUCATION AND RELIGION. The University of Uruguay, at Montevideo, has a faculty of about 100 instructors and over 400 regular students. There are also a school of art, an industrial school, a museum and a library, and a military school. The Government contributes annually about $700,000 toward the maintenance of about 600 public elementary schools, enrolling about 55,000 pupils. In addition there are over 300 private schools of this grade with about 22,000 pupils. Notwithstanding a compulsory education law, the school attendance is only about 8 per cent. of the total population. Roman Catholicism is the State religion, but there is complete toleration of other sects.

HISTORY. The natives of the "Banda Oriental," the region to the northeast of the Plata River, for many years prevented any exploration of the interior, and in 1580 forced the garrison to abandon the only fort established in their territory, on the San Salvador River. In 1603 a powerful Spanish force, intended to protect a colony, was defeated, and it was not until the year 1624 that the first settlement which became permanent was founded, at Santo Domingo de Soriano, on the Rio Negro. The Portuguese of Brazil claimed this region as a part of their territory, and their outposts crept down the coast from Rio de Janeiro, until, in 1680, they established themselves at Sacramento, not far distant across the river from Buenos Ayres. The local Spanish officials profited by the commerce between this city and the Portuguese, and for fifty years no very serious efforts were made to drive them away. In 1723 the Portuguese fortified the heights surrounding the Bay of Montevideo and apparently planned to enter into more active competition with Buenos Ayres. This aroused the Spaniards, who promptly organized an expedition which forced the surrender of the Portuguese works at Montevideo, where a colony of families from Buenos Ayres was established. Intermittent conflicts between the two claimants fill the annals of the remainder of the eighteenth century, resulting in the ultimate establishment of the Spanish rule. In 1807 the English fleet under Popham captured Montevideo, but their occupation ended with the failure of the attack on Buenos Ayres. The inhabitants of Uruguay promptly joined those of Argentina in the revolt against Spain in 1810, and established an independent confederation under the Protector Artigas (q.v.); the Spaniards were driven from Montevideo in 1814. The country was weakened and demoralized by the efforts to drive out the Spaniards, and the Portuguese in Brazil, perceiving their opportunity, revived their claim to the territory. They captured Montevideo and drove Artigas into the interior, until he was forced to take refuge in Paraguay. Uruguay was annexed to Brazil as the Cisplatine State. The Uruguayan patriots established headquarters across the Rio de la Plata in Buenos Ayres, watching for an opportunity to revive the struggle. This came in 1825, when an insurgent force was organized which won several engagements and shut the Portuguese up in their coast strongholds. In February, 1828, the Brazilians were decisively defeated, and in August peace was concluded and the independence of Uruguay was recognized. In 1830 the República Oriental del Uruguay was organized, and for five years the country enjoyed comparative quiet under the Presidency of Fructuoso Ribera. In 1835 he was succeeded by Manuel Oribe and soon a political conflict broke out between the two, terminating in civil war. Ribera made himself the leader of the Gauchos (q.v.) constituting the great mass of the non-Indian population, while Oribe represented the interests of the great landowners. In 1838 Ribera succeeded in overthrowing Oribe, who thereupon turned for aid to Rosas (q.v.), the dictator of Buenos Ayres. With the aid of Argentina's troops Oribe repeatedly defeated his rival, but could not make himself master of Montevideo, which was besieged from 1842 to 1851. In the latter year the party of Ribera concluded an alliance with Brazil, and the State of Entre Rios, which, under Urquiza, had broken away from the Argentine Confederation. Oribe was overthrown, and the party of Riberas, after a short interval, was restored to power. In 1854 Venancio Flores was elected President, but was forced to resign in the following year. There ensued a period of utter disorder marked by close successions of elections and insurrections until, in 1864, Brazil intervened to restore order, and in the following year brought Flores back to power. An alliance with Brazil and Argentina was concluded in the same year, directed against the dictator Lopez (q.v.) of Paraguay. This war, which brought ruin upon Paraguay, terminated in 1870. Flores was assassinated early in 1868, and five years later José Ellauri was legally elected President. During his administration many public works were undertaken, and the transatlantic cable laid, with the result that the national finances became complicated.

In May, 1875, Pedro Varela became President, to be succeeded a year later by Colonel Latorre. Numerous changes, at irregular intervals, followed. President Idiarte Borda, who was elected in 1894, was assassinated in 1897, and was succeeded by Juan Lindolfo Cuestas, who, in spite of some attempts at revolution, retained power till 1903. In March of that year he was succeeded by José Battle y Ordoñez.

Bibliography. Murray, *Travels in Uruguay* (London, 1871); Diaz. *Notice historique* (Paris, 1878); Bauza, *Historia de la dominación española en el Uruguay* (Montevideo, 1880); Ramon Lopez Lomba, *La república oriental del Uruguay* (ib., 1884); Van Bruyssel, *La république orientale de l'Uruguay* (Brussels, 1889); Vincent, *Round and About South America* (New York, 1890); De Saint-Foix, *La république orientale de l'Uruguay* (Paris, 1892); Arreguine, *Historia del Uruguay* (Montevideo, 1892); Aranjo, *Compendio de la geografía nacional* (ib., 1894); Julio Silva y Autuna, *Comercio exterior de la república oriental del Uruguay, Años 1887-94* (ib., 1895); Keane, *Central and South America* (London, 1901); *The Uruguay Republic: Territory and Conditions* (London, 1888).

URUMCHI, ų-ro͞om'chė. The capital of the Province of Sint-siang, in Sungaria, Chinese Empire, and the seat of the Chinese administration of Eastern Turkestan, 320 miles east of Kulja (Map: Asia, H 4). It derives its strategic importance from its position on the only road leading from Sungaria to Eastern Turkestan which is available for heavy artillery. The population, which is supposed to have been 200,000 at the beginning of the nineteenth century, is now estimated at 30,000.

URUMIAH, o͞o'ro͞o-mē'yȧ, **OROOMIAH**, or **URMIA**. A city of Persian Armenia (included in the Province of Azerbaijan), 70 miles southwest of Tabriz and 10 miles west of Lake Urumiah (Map: Persia, B 2). It lies amid attractive mountain scenery. The American, French, and Anglican missions have headquarters here, and have founded several institutions, including Urmia College, a college for priests and deacons, and Fiske Seminary. The district produces fruit, cotton, and tobacco, and there are important dyeing and weaving interests. Population, estimated at from 30,000 to 50,000. Urumiah is reputed to be the birthplace of Zoroaster. It was for a long time the pilgrimage city of his followers.

URUMIAH, Lake. The largest lake in Persia, situated in the northwestern corner of the country, 170 miles west of the Caspian Sea (Map: Persia, B 2). It is about 80 miles long, with an average breadth of 20 miles, and occupies part of a level basin inclosed by mountains and lying at an altitude of over 4000 feet. The lake is fed by several streams of considerable size, but it has no outlet. It is consequently very saline, so much so that fish cannot live in it; the shores are covered with salt incrustations. The lake is very shallow, the mean depth being 6 feet, and the maximum about 40 feet. The surrounding region is very fertile, and is covered with vineyards, orchards, and gardens.

URUS (Lat. *urus*, Gk. *οὖρος*, *ouros*, wild ox, from OHG., AS. *ūr*, Ger. *Auer-ochs*, whence the English *aurochs*, designating a different animal, the European bison; connected with Skt. *usra*, steer, reddish). A wild ox (*Bos primigenius*) which anciently inhabited the forests of Central Europe, and is described by Cæsar as common in the Hercynian Forest, and of great size, swiftness, and fierceness. The probability is that the urus was the wild original of the domestic ox, by way of the small or long-fronted ox (*Bos longifrons*), which was the earliest known domesticated ox in Europe. The urus survived in Germany until the twelfth century, and is sometimes wrongly identified with the aurochs (q.v., under Bison).

US'BEGS. A people of Russian Turkestan. See Uzbeks.

USE AND OCCUPATION. In law, a phrase employed to denote the beneficial enjoyment of real estate by a person with the owner's consent, but without any definite or enforceable agreement as to the amount of rent to be paid. The landlord is entitled to recover a reasonable amount for the 'use and occupation' of the premises. See Landlord and Tenant; and consult the authorities there referred to.

USEDOM, o͞o'*ze*-dôm. An island belonging to the Province of Pomerania, Prussia, situated at the mouth of the Oder River (Map: Prussia, E 1). Together with the island of Wollin, it separates the Stettiner Haff from the Baltic Sea. It is divided from the mainland on the west by the outlet of the Peene River. Length, 33 miles; area, 158 square miles. It is extremely irregular in shape. It is level and generally fertile save for some sand dunes. Its farm lands and forests are productive. Fishing and commerce also engage the attention of its inhabitants, who number about 35,000. In summer the sea baths attract a large number of visitors. Swinemünde is the principal town.

USE-INHERITANCE. The Lamarckian principle of the transmission by heredity of characters acquired during the lifetime of the individual; they are contrasted with congenital characters. That slight lesions are not transmitted was apparently proved by the experiments of Weismann in docking the tails of white mice for nineteen generations, and his finding that such a mutilation was not transmitted. At the present time the alleged transmission of mutilations or various lesions, as tattooing or flattening of the head, is not proved. On the other hand, the Lamarckian principle of the inheritance of characters formed by adaptation to changes in the physical environment, changes of climate, as well as those resulting from use or disuse, or any kind of external stimulus, although denied by Weismann and his followers, have not been disproved. Adaptation to a different medium from that of their ancestors, as in the case of birds and insects, is the result of use-inheritance. Very obvious examples are the cetaceans where, by change from terrestrial to aquatic habits, the legs have been converted into fin-like members. Another instance is the acquired habit of pointing in the pointer breed, cases being known of young dogs pointing without having been trained. The habit of holding the tail erect is an acquired one in dogs, as the wolf and fox never elevate the tail. The senile expression of the face in children of old parents is claimed to be an example of such inheritance. Such examples as these prove that, as Eimer states, every character formed by the functional activity of the animal is an acquired character. The changes begin during the lifetime of the individual, become transmitted (or at least the tendency), until after a number of generations, the new conditions becoming permanent, the new characters are formed, and these are preserved by use-inheritance.

The experimental proofs of use-inheritance have accumulated sufficiently to prove that, where the changed climate, or temperature and moisture or dryness of the air, remain the same, the new characters are transmitted. In plants, where use or disuse do not come into play, the changes of station, of climate, temperature, soil, and nutrition, when permanent, result in the formation of new varieties and species, according to the Lamarckian principle. It is maintained that the transmission of acquired characters, structural, physiological, and mental, is demanded by the theory of evolution. Weismann's objection to use-inheritance is that modifications of the animal are acquired anew in every individual life and cannot be transmitted. It remains to be seen whether this criticism will withstand the mass of data now being accumulated. Consult the writings of Lamarck, Darwin, Koelliker, Eimer, Cope, Herbert Spencer, Galton, Hyatt, Weismann, Standfuss, Fischer, Packard, Piepers, Kidd, and others. See EVOLUTION; HEREDITY.

USENER, ōō'*ze*-nĕr, HERMANN (1834—). A German classical philologist, born at Weilburg-on-the-Lahn. He became professor at the University of Bonn in 1866. His work has covered many fields, both literary and philosophical. Especially important are his studies in the history of religion. His published works include *Anecdoten Holderi* (1877), *Altgriechischer Versbau* (1887), *Epicurea* (1887), *Dionysius Halicarnensis de Imitatione*, etc. (1899), *Dionysii Ars Rhetorica* (1895), *Dionysii Opuscula* (ed. with Radermacher, vol. 1., 1899), *Religionsgeschichtliche Untersuchungen* (1888), *Götternamen* (1896), *Sintflutsagen* (1899), etc.

U'SERTE'SEN. The name of three kings of Egypt of the Twelfth Dynasty. USERTESEN I., the Σεσόγχωσις of Manetho, was the son and successor of Amenemhat I. (q.v.), the founder of the dynasty. His reign of 44 years began about B.C. 1976, but for the first ten years he ruled as co-regent with his father, and for the last two years of his life his son, Amenemhat II., was associated with him on the throne. According to a leather roll, written in the time of Amenophis IV., the temple of the sun at Heliopolis was rebuilt in the early part of Usertesen's reign. One of the two granite obelisks erected by Usertesen before this temple is still standing; it is 66 feet in height and is the oldest obelisk in Egypt. (See OBELISK.) At Tanis three finely executed granite statues of the King have been found. A stele was discovered by Champollion at Wadi Halfa, near the second cataract of the Nile, containing a list of eleven Nubian tribes conquered by Usertesen, and an inscription at Beni Hassan records an expedition to Nubia in the King's forty-third year. The remains of Usertesen's pyramid tomb are still to be seen at Lisht, about 30 miles south of Cairo. —USERTESEN II., the fourth King of the dynasty, was the son of Amenemhat II., and the grandson of Usertesen I. He reigned from about B.C. 1896, being for a short time co-regent with his father. A painting in a tomb at Beni Hassan, which depicts a number of Asiatics visiting the Nomarch Chnumhotep in the sixth year of Usertesen II., has been supposed to represent the arrival in Egypt of Abraham or of the sons of Jacob, but there is no evidence in support of either theory, and both are equally improbable. Statues of Usertesen II. and of his Queen, Nofret, were found at Hieraconpolis and at Tanis respectively. The pyramid tomb of the King is at Illahun. Manetho calls this King Sesostris and ascribes to him the conquest of the world, but there is no evidence that Usertesen II. ever conducted any foreign wars. (See SESOSTRIS.)—USERTESEN III., the son and successor of Usertesen II., reigned for at least 26 years from about B.C. 1883. His chief energies were directed to the subjugation of Nubia; and to protect the southern frontier of his kingdom, he built two strong forts at Semneh and Kummeh, about 40 miles south of the second cataract of the Nile. Near Semneh the King set up, in the eighth year of his reign, a boundary stone with the injunction that no negro should pass it except such as came into Egypt for the purpose of peaceful traffic. He was, however, compelled to undertake two subsequent expeditions against the Nubians in the sixteenth and nineteenth years of his reign, before the country was finally subdued. Usertesen III. built a temple at Heracleopolis (q.v.) in his fourteenth regnal year. His tomb is probably the more northerly of the two brick pyramids at Dahshur known as the Black Pyramids. Consult: Wiedemann, *Aegyptische Geschichte* (Gotha, 1884-88); Petrie, *A History of Egypt* (New York, 1899); Budge, *A History of Egypt* (ib., 1902).

USES. A technical term employed to denote equitable rights to the benefits and profits of real estate, the legal title to which is in a person other than the beneficiary of the 'use.' The introduction of the doctrine of uses was the result of the attempts of the English clergy to evade the effects of the Statutes of Mortmain, and to enjoy the gifts of the pious. To do this, land was conveyed to a third person, with the understanding or an express declaration that it was to be held *to the use of* the religious person or corporation intended to be the real donee. When this practice was first introduced, this obligation could only be enforced by threats of excommunication from the Church. Afterwards the Chancellor, who was usually appointed from the clergy, assumed jurisdiction over such conveyances, and employed the power of the courts of equity to enforce the *use.* This effect of such conveyances aroused the hostility of the King and great lords of the realm, which culminated in the enactment of the famous statute of 27 Henry VIII. c. 10, commonly known as the Statute of Uses. This act provided, in effect, that where a conveyance was made under the circumstances above described, the beneficiary should receive the legal estate as well as the right to the profits, etc., and also be liable to the lord for the feudal duties. The statute only temporarily accomplished its purpose, as the courts of equity speedily evolved the law of 'trusts,' which were practically the same as 'uses,' but under a different name. However, the statute had the important effect of making possible the creation of legal estates to begin in the future without making them legal remainders. The system of conveyancing made possible by the Statute of Uses was finally superseded by the practice of transferring property by deeds of 'bargain and sale.' The law of uses, as modified by the Statute of Uses, became a part of the common law of the United States, and still obtains in many States, but has been expressly abolished in a few jurisdictions, including New York. Consult Gilbert, *Law of Uses and Trusts* (3d ed., London, 1811), and the authorities referred to under REAL PROPERTY; also see TRUST.

USHAK, ōō-shäk′. A town of the Vilayet of Brusa, Asia Minor, Turkey, 125 miles east-northeast of Smyrna (Map: Turkey in Asia, C 3). It is noted for its carpet manufactures. Population, in 1900, 13,084 (estimated).

USH'ANT. An island in the Atlantic Ocean, belonging to the Department of Finistère, France, 13 miles west of the northwest end of Brittany (Map: France, A 3). To the French it is known as the Isle d'Ouessant. Area, 6 square miles. The shores are rocky. Ushant has modern fortifications, and is used for military purposes. Naval battles between the French and English occurred off the island in 1779 and 1794. Population, in 1901, 2717, mostly pilots and fishers.

USHAS, ụsh′ȧs (from Skt. *vas, uṣ,* to burn; connected with Gk. 'Ηώς, *Eōs,* Lat. *Aurora,* Lith. *auszrà,* dawn, and ultimately with Eng. *east*). In Vedic India, the goddess of the dawn. The Rig-Veda devotes twenty hymns to her, and alludes hundreds of times to her as the divine personification of the morning light. The fiery steeds or ruddy cows that draw her shining car represent clouds and beams of light that issue from the stall of darkness as she throws open the portals of day. Born each day, and therefore ever young, she reminds mankind of the transitoriness of human life, and by her return day after day she stands as a symbol of the divine order in heaven. The sky is her father; night is her sister; the sun, her lover and spouse; and the twin Asvins, as embodiments of the transition of light and darkness at the dawn and evening twilights, are her kin. The sacrificial fire kindled at daybreak is a signal of her approach (see AGNI), and she then arouses the worshiper to prayer. She answers his petitions by bestowing riches, long life, offspring, glory and renown, in fact, all the blessings that belong to daily life. In the post-Vedic period the importance of Ushas is lost, and now she is a mere name in the Hindu mythology. Consult: Macdonell, *Vedic Mythology* (Strassburg, 1897); Hopkins, *Religions of India* (Boston, 1895); Wilkins, *Hindu Mythology* (2d ed., London, 1900).

USH'ER, JAMES. A British archbishop. See USSHER.

USHUAIA, ōō′shōō-ï′yȧ. The capital of the Territory of Tierra del Fuego, Argentina, on the southern coast of the island of Tierra del Fuego, on the Beagle Channel (Map: Argentina, D 14). It is a miserable native village, whose inhabitants, through the efforts of English missionaries, speak English better than Spanish.

USKUP, ụs-kụp′, **USKUB,** or **SKOPLIE.** The capital of the Vilayet of Kossovo, European Turkey, 160 miles northwest of Saloniki, on the Vardar River (Map: Balkan Peninsula, C 4). In 1900 it carried on a trade of nearly $5,000,000. The chief articles of commerce are opium, grain, live stock, fruit and tobacco. Leather and dyestuffs are the principal manufactured products. Population, about 40,000.

USNEA, ŭs′nê-ȧ (Neo-Lat., from Ar. *usuah,* moss). The small genus of lichens typical of the family Usneĕi. The species are generally grayish or straw-colored and pendulous, and from their resemblance to southern or Spanish moss (Telandsia) are often called tree-mosses. They are most common upon trees in cool regions, but also grow upon rocks. They are called beard-moss, hanging-moss, and necklace-moss. See Colored Plate of MOSSES AND LICHENS under MUSCI.

US'SHER, JAMES (1580-1656), Archbishop of Armagh, commonly considered the most learned prelate of the Irish Protestant Church. He was born in Dublin, January 4, 1580. In 1593-94 he entered Trinity College, Dublin, where his predilection for history soon revealed itself. In 1601 he was ordained deacon and priest, and was appointed preacher of Christ Church, Dublin. In 1607 he was chosen to the chair of divinity, a post which he held for thirteen years. He made numerous visits to England and became acquainted with the most distinguished scholars of the age. In 1613 his first publication appeared, entitled *De Ecclesiarum Christianarum Successione et Statu,* which was designed as a continuation of Bishop Jewell's *Apology.* In 1615 he was appointed by a convocation of the clergy held at Dublin to draw up a series of articles relating to the doctrine and discipline of the Irish Protestant Church, in which the doctrines of predestination and reprobation (of which Ussher was an unflinching apologist) found prominence. These and other views, such as that bishops were not a different order from presbyters, implied in the studied omission of all reference to such distinction, that the Sabbath should be strictly enforced, and that no toleration should be granted to Catholics, laid him open to the charge of Puritanism. Nevertheless, King James promoted him to the Bishopric of Meath and

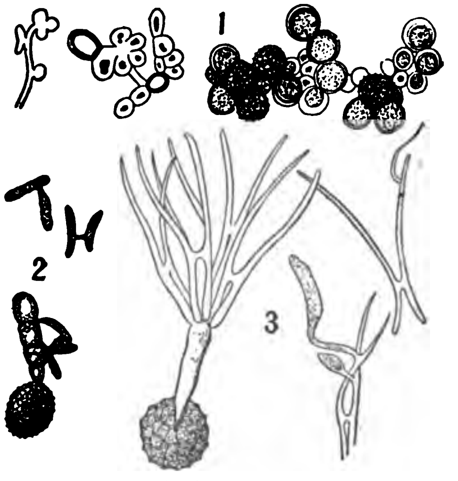
Clonmacnoise in 1621 and in 1623 constituted him a Privy Councilor of Ireland. In 1624-25 he was raised to the highest ecclesiastical dignity in Ireland, the Archbishopric of Armagh. In 1632 Ussher published *Veterum Epistolarum Hibernicarum Sylloge*, a collection of letters out of several ancient MSS., concerning the state of the Irish Church from 592 to 1180; in 1638, *Immanuel, or the Mystery of the Incarnation;* in 1639, *Britannicarum Ecclesiarum Antiquitates*, an account of the British Church from the first planting of Christianity to the end of the seventh century; in 1641, *The Judgment of Doctor Rainololdes touching the Originall of Episcopacy confirmed;* and *The Originall of Bishops.* When the Civil War broke out, Ussher, who was in England at the time, espoused the side of the King, refused to sit, when nominated, among the assembly of divines at Westminster, and made himself obnoxious to the Parliament by the sermons which he preached at Oxford. When the fortunes of the King began to decline, Ussher left Oxford; his property and revenues in Ireland were seized, and after a residence in Wales and elsewhere, he came to London, where in 1647, in spite of his Royalist sympathies, he was chosen by the benchers preacher of Lincoln's Inn, a post which he retained till his death at Reigate, March 21, 1656. Cromwell ordered his remains to be interred with great magnificence in Erasmus's Chapel in Westminster Abbey.

Ussher's chief works, besides those already mentioned, are his edition (1644) of the *Epistolæ* of Polycarp and Ignatius; his treatise *De Romanæ Ecclesiæ ' Symbolo Apostolico Diatribe* (1647); *Dissertatio de Macedonum et Asianorum Anno Solari* (1648); and *Annals of the Old Testament* (1650-54), a chronological work. After his death there were published (from his numerous MSS.) *Chronologia Sacra*, etc. (Oxford, 1660), by which and his *Annals* he is most widely known. These chronological calculations long appeared in the inner margin of the Bible in the Authorized Version. The most frequently reprinted work attributed to him is the posthumous *Strange and Remarkable Prophecies and Predictions of James Ussher* (London, 1678; new ed. 1825). A collected edition of Ussher's works, in 71 vols., with a new biography, was published at Dublin in 1841-64 by C. R. Elrington and J. H. Todd. Consult also the *Life* by Carr (London, 1895), and W. B. Wright, *The Ussher Memoirs* (Dublin, 1889).

USSURI, o͞o-so͞o'rē. A right-bank tributary of the lower Amur (Map: Asia, N 4). Its headstreams rise to the northeast of Vladivostok. After a course of 90 miles it receives the Sungachi, which drains Lake Khangka. The Sungachi and, below their confluence, the Ussuri, form the boundary between Manchuria and the Russian Maritime Province, a navigable waterway 478 miles in length. The general course of the Ussuri is northeasterly, and it joins the Amur in 48° 16′ N., 134° 53′ E., at the village of Kazakevicheva, a little west of Khabarovsk. For a large part of its course the Ussuri is paralleled by the Russian railway connecting Khabarovsk and Vladivostok.

UST-BYELOKALITVENSKAYA, o͞ost byĕ'-lō-kä'lĕt-vĕn'skȧ-yȧ. A Cossack settlement in the Province of the Don Cossacks, southeastern Russia, on the Donetz, about 70 miles northeast of Tcherkask. Population, in 1897, 18,039.

USTILAGINALES, ŭs'tĭ-lăj'ĭ-nā'lēz (Neo-Lat. nom. pl., from Lat. *ustilago*, plant of the thistle kind, from *urere*, Skt. *uṣ*, to burn). A group of parasitic fungi commonly called 'smuts,' and found on flowering plants, whose floral parts and ovaries especially are subject to the attack. Some smuts are very destructive, as corn smut (*Ustilago maydis*) and the stinking smut of wheat (*Tilletia tritica*). The vegetative mycelium of the smut is inconspicuous until the season is well advanced and the ovary should begin to ripen. Then the ovary and the adjoining floral parts become filled with the fungal filaments, causing grotesque malformations. At the end of the season this mycelium becomes transformed into immense quantities of resting spores (chlamydospores) that probably correspond to the teleutospores of the rusts (Uredinales, q.v.). These escape as a black powder, and survive the winter, germinating with the return of spring. The spore develops a short filament (promycelium), which exhibits far greater variation of structure than in the rusts. Numbers of minute spores (sporidia) are developed by the promycelium, and, falling upon the seedlings and young plants of the proper host, germinate, sending the germ tubes through the stomata into the tissues.



USTILAGINALES.

1, Development of spores; 2 and 3, germination of spores promycelia, and fusing sporidia; 2, Ustilago; 3, Tilletia.

For a general account of the Ustilaginales consult: Engler and Prantl, *Die natürlichen Pflanzenfamilien* (Leipzig, 1887), and Plowright, *British Uredineæ and Ustilagineæ.*

UST-MEDVYEDITZA, o͞ost mĕd-vyĕd'ĭt-sȧ. A Cossack settlement in the Province of the Don Cossacks, Southeastern Russia, situated on the right bank of the Don, near its confluence with the Medvyeditza. Population, in 1897, 15,999.

USTYUG VELIKY, ṳs-tyṳk′ vyĕ-lyē'kē. A town in the Government of Vologda, Russia, situated at the junction of the Sukhona with the Yug, 303 miles northeast of Vologda (Map: Russia, G 2). Population, in 1897, 11,309.

USUFRUCT (Lat. *ususfructus*, from *usus*, use, from *uti*, OLat. *olti*, to use, connected with *avere*, to crave, Skt. *av*, to promote, protect, like, Gk. οἶτος, *oitos*, fate, portion + *fructus*, fruit, from *frui*, to enjoy). At civil law, a life interest in property, usually established by legacy, but capable of being established by contract. It is also created by law, especially in modern civil legislations, many of which give usufruct to parents in the property of minor children and to the surviving spouse in the estate of the deceased husband or wife. (See PARENT AND CHILD; SUCCESSION; and TESTAMENT.) Usufruct is regarded as a servitude (q.v.), the general right of ownership (*proprietas*) being attributed to the reversioner, i.e. the person who is to take the property on the termination of the usufruct. The usufructuary has the exclusive right to possess, use, and enjoy the property, either in person or through a vendee or lessee. He must, however, use it *salvâ substantiâ*, i.e. the property must not be injured; nor may he change the character or mode of use. For the restoration of the property in unimpaired condition the usufructuary must ordinarily give security to the owner. Usufruct may be established not only in land and buildings, but also in 'non-consumptible' movables, i.e. in such movables as can be used without impairment of substance. In consumptibles, true usufruct is impossible; but for the purpose of carrying out the intentions of testators the Roman jurists developed the so-called 'quasi-usufruct,' in which the property is appraised and the usufructuary gives security that the sum at which it is valued shall be paid, after his death, to the holder of the reversionary interest.

USUMACINTA, o͞o′sṳ-mȧ-sēn′tȧ. A river of Central America. It rises in the mountains of Southern Guatemala and flows in a winding northwest course through that country and Mexico, emptying into the Gulf of Campeche on the boundary between the Mexican States of Campeche and Tabasco (Map: Central America, B 2). Its length is about 400 miles, and it is navigable a short distance from the sea. In its middle course it forms the boundary between Mexico and Guatemala. Its upper course, which is through a little known forest region, was made by treaty the boundary between the two republics, and a dispute as to which was the main headstream nearly led to a war in 1895.

USURY (OF., Fr. *usure*, from Lat. *usura*, use, employment, interest, from *uti*, to use). Literally, money paid for the use of money, i.e. interest; but in the Middle Ages, when such payments were prohibited, the word obtained an evil sense, and when in modern times the taking of interest again became permissible, usury acquired its modern meaning, i.e. interest in excess of a fair return, and, particularly, in excess of a legally determined maximum. The establishment of such a maximum was general in the ancient world; at Roman law it varied, at different periods, from 12 per cent. to 6 per cent.; and when the taking of interest was legalized in the modern world, similar limitations were introduced. In England the act of 37 Henry VIII., c. 9, fixed the limit at 10 per cent. This was repeatedly lowered until, by the act of 12 Anne, c. 16, it was fixed at 5 per cent. By these laws usurious contracts were made wholly invalid and usury was an indictable offense. In most European countries (as in the Roman law) usurious contracts were invalid only as regarded the excess of interest, and contracts in which the lender assumed special risks (e.g. bottomry bonds) were not subjected to limitation of rate.

In the eighteenth century the usury laws were attacked by economic writers as arbitrary and unwise. It was pointed out that in all credit transactions there was an element of risk; that the risk varied greatly and might, in many cases, justify the taking of interest beyond the legal maximum; and that the effect of usury laws was to impose upon borrowers a higher rate of interest than they would otherwise be required to pay, in order that the lender might insure himself against the additional risk to which he was subjected by the illegality of the contract. In consequence of these arguments, limitations upon the rate of interest were generally repealed in the nineteenth century. In England this was done by the act of 17 and 18 Victoria, c. 90. In France, however, the usury laws were repealed only as regarded commercial contracts.

Adam Smith defended usury laws because they made it more difficult for spendthrifts to borrow money; and in the latter half of the nineteenth century, in connection with the general reaction against *laissez-faire* doctrines, the complete freedom of contract established by the repeal of the usury laws was in its turn condemned by many economists. It was urged that in many cases borrowers were at the mercy of lenders and that they should be protected against extortion of unreasonable interest. This theoretical reaction has affected modern European legislation. In Germany, by a law of 1880, "any person who, by exploiting the necessity, the frivolity, or the inexperience of another, causes to be promised to himself or to a third person, for a loan or for deferred payment of a debt, pecuniary advantages which so exceed the ordinary rate of interest that under the circumstances they are in striking disproportion to the debt," is punished with imprisonment up to six months and fine up to 3000 marks. In England, by an act of Parliament passed in 1900, it is provided that professional money-lenders shall be registered, and that their contracts shall be subject to judicial revision when the rate of interest appears under the circumstances to be unreasonable. In the United States this latest form of legislation against usury, in which it is left to the courts to determine what is, in each case, a reasonable rate, has not as yet been imitated. In more than one-fourth of the States and Territories (Arizona, California, Colorado, Connecticut, Florida, Maine, Massachusetts, Montana, Nevada, Rhode Island, Utah, Washington, Wyoming) the parties may agree upon interest above the legal rate. In the remainder of the States and Territories a legal maximum is established for interest on loans and 'forbearances' or deferred payments (see table in article INTEREST), but the legal results of contracting for a higher or usurious rate are very varied. In Georgia, Indiana, Kentucky, Louisiana, Maryland, Michigan, New Hampshire, New Mexico, Pennsylvania, Tennessee, Vermont, and West Virginia the creditor can recover principal and lawful interest, losing only the excess. In Kansas his claim is reduced by double the excess. In Alabama, the District of Columbia, Idaho, Illinois, Iowa, Mississippi, Missouri, Nebraska, New Jersey, North Carolina, Ohio, South Carolina, South Dakota, Texas, Virginia, and Wisconsin, the lender recovers the principal only; but in Idaho and Iowa the interest which the lender loses is paid by the borrower to the school fund. In Arkansas, Delaware, Minnesota, New York, North Dakota, and Oregon, the usurious contract is wholly invalid, and the lender is unable to recover the principal; but in Oregon the principal which he loses is paid by the borrower to the school fund. In some of these States money actually paid on a usurious contract cannot be recovered by the lender; but the general rule is to the contrary; and in some States the actual receipt of usurious interest exposes the lender to further penalties, e.g. twice the excess in South Carolina, three times the excess in New Hampshire and Wisconsin, and twice the interest paid in New Mexico and North Carolina. In some other States the lender is liable to prosecution and fine or imprisonment, but such prosecutions are rare. In Delaware any person may bring action against a lender who has received usurious interest, and if successful, will receive one-half of the principal of the debt, the other half going to the State.

Not infrequently special contracts are exempted from the operation of the usury laws, either because special risks are assumed by the lender, or on grounds of commercial interest. In several States corporations are not permitted to plead usury.

Usury laws are, in general, strictly construed. Whenever the law declares a usurious contract invalid, mortgages, trust deeds, and all forms of surety are also invalidated; but the courts do not assume that a legislature has intended to avoid the contract as regards the principal of the debt, or as regards the legal interest, unless such penalty is expressly imposed; nor is penalty, as distinguished from the protection of the borrower, incurred by merely stipulating for usurious interest, but only by receiving it.

In interstate cases (conflicts of law, q.v.), the question whether a contract is or is not usurious is governed by the law of the place where the contract was concluded, unless a different place was expressly or impliedly indicated as the place of performance. When a debt has been contracted in one State to be paid in another, and the rate of interest stipulated is usurious in one of the States, but not in the other, some of the courts apply the local law which will uphold the contract. Penalties in the strict sense (as distinguished from the legal protection given to the borrower) are not enforced outside of the jurisdiction in which they are imposed. See INTEREST.

Consult: Turgot, *Mémoire sur les prêts d'argent* (1741); Bentham, *Defense of Usury* (London, 1787); Von Stein, *Der Wucher und sein Recht* (1880); Caro, *Der Wucher; eine socialpolitische Studie* (1893); Murray, *History of Usury* (Philadelphia, 1866); Webb, *A Treatise on the Law of Usury* (1899).

UTA (Neo-Lat., from the Territory of *Utah*). A genus of iguanid lizards, several species of which are numerous on the Southwestern plains of the United States, one of which (*Uta Stansburiana*) is one of the most beautiful and graceful of American lizards. It is blackish brown above, marbled with lighter dots, and banded with yellow below. Its long, slender tail has a crest of large vertically set scales. This genus combines structural characteristics of Sceloporus and Holbrookia.

UTAH, ū'tä *or* ū'ta̤ (named from the Ute or Utah tribe of Indians). A Western State of the United States, called by the Mormon settlers *Deseret*, a word taken from the Book of Mormon and signifying 'Industry.' It lies between latitudes 37° and 42° north, and longitudes 109° 4′ and 114° 4′ west, and is bounded on the north by Idaho and Wyoming, on the east by Colorado, on the south by Arizona, and on the west by Nevada. Its shape is that of a rectangle 345 miles long from north to south, and 270 miles wide. The rectangle is indented in the northeast by a corner of Wyoming, but all the boundaries of the State are formed by lines of latitude and longitude. The State has an area of 84,970 square miles, including 2780 square miles of water. It ranks eighth in size among the States.

TOPOGRAPHY. Utah is divided into two parts by the Wasatch Range, which enters it near the middle of the northern boundary and runs southward, gradually curving toward the southwestern corner. The range forms the eastern boundary of the Great Basin, to which the western part of the State belongs. The Wasatch is a lofty and rugged mountain mass broken by deep and picturesque gorges, and reaching at several points an elevation of over 12,000 feet. It sends out a number of spurs to the east, and along the northeastern boundary runs a cross range known as the Uintah Mountains, the loftiest range in the State, with four peaks over 13,000 feet high, among which is Gilbert Peak, the highest point in Utah, with an altitude of 13,687 feet. The eastern half of the State is a plateau with an average elevation of 6000 to 8000 feet. It is broken by a number of isolated mountain groups, such as the Henry, Abajo, and La Sal Mountains, from 11,000 to over 13,000 feet in altitude, and cut by the deep cañons of the Colorado and its branches. Western Utah consists of the level basin-floor lying at a nearly uniform altitude of 5000 feet, from which a number of short, parallel, north and south ranges rise from 2000 to 3000 feet above the intervening valleys.

HYDROGRAPHY. Eastern Utah is drained wholly by the Colorado and its main headstream, the Green River. They receive from the slopes of the Wasatch and Uintah Ranges a large number of small streams, but these soon unite into a few branches which, together with the main river, flow in deep cañons far below the plateau floor. The extreme northwestern corner of the State sends its waters to the Snake River, but the entire remaining portion belongs to two of the closed drainage systems of the Great Basin, that of Sevier Lake, which receives the Sevier River, and that of the Great Salt Lake. The latter, the most prominent natural feature in the State, lies in its northwestern portion, and has a length of 80 miles and a width of from 18 to 48 miles. It receives from the south the outflow of Utah Lake through the Jordan River, and from the north that of Bear Lake through the Bear River.

CLIMATE. The climate is of the continental type, with sudden changes and great extremes in summer and winter, although the valleys, being well sheltered, have generally a mild and pleasant climate. The mean temperature for January is 27.9° at Salt Lake City, 24.1° at Snowville in the extreme north, and 35.8° at Saint George in the extreme southwest. For July the mean is 75.5° at Salt Lake City, 69.5° at Snowville, and 83.1° at Saint George. The lowest temperature ever observed at any of the regular stations is 34° below zero, and the highest 115°. The snowfall is light, but in the mountains the winters are very severe, and the summits are capped with perpetual snow. The rainfall throughout the State is insufficient for the needs of agriculture, and irrigation is everywhere necessary. The average precipitation for the State is 12 inches. The greatest amount falls in the north central portion, the average precipitation at Salt Lake City being 16.2 inches. Elsewhere it is less than 10 inches, falling to 6 inches in the southwest.

Soil and Vegetation. The soil of the valleys, where it does not hold injurious amounts of alkaline deposits, usually contains the elements of fertility, which render it very productive when irrigated. It is at best a sedimentary loam composed of sand and clay, but in some places it is rocky or gravelly. Where not irrigated by artificial canals or natural watercourses the country is arid and treeless, covered with sagebrush on the plains, though the higher slopes are grassy. To the southwest of the Great Salt Lake lies the wide, arid plain known as the Great Salt Lake, or Great American, Desert. For details of the flora and for fauna, see paragraphs under Rocky Mountains.

Geology and Minerals. The surface formations of the State are somewhat complicated and irregular in their outcrops. Ancient crystalline rocks appear as the core of the Uintah Mountains in the northeast. They are flanked by narrow outcrops of Jurassic and Cretaceous strata, south of which there is a broad area of Eocene formation. The great plateau forming the southeastern quarter of the State is almost wholly of Jurassic and Cretaceous age. The Wasatch Mountains present in their northern half a narrow ridge of Carboniferous rocks protruding through the Cretaceous and Tertiary strata, but their southern half is formed mainly of great masses of igneous rocks. The isolated ranges of western Utah are of Carboniferous and older Paleozoic formation, yet the basin-floor surrounding them is overlaid by sediment from Lake Bonneville (q.v.), a Pleistocene lake whose remnants still remain in the Great Salt and Sevier lakes. The mineral wealth of Utah includes extensive coal deposits on the eastern slope of the Wasatch and ledges of iron ore in the southwest. Gold is found chiefly in the Oquirrh Range south of the Great Salt Lake, while silver occurs in considerable quantities in connection with the lead and copper ores which are abundant in many of the mountain ranges. Other important minerals found in the State are manganese, deposited in the Triassic sandstone of the eastern plateau, gypsum, rock salt and borax, sulphur, pumice, and asphaltum.

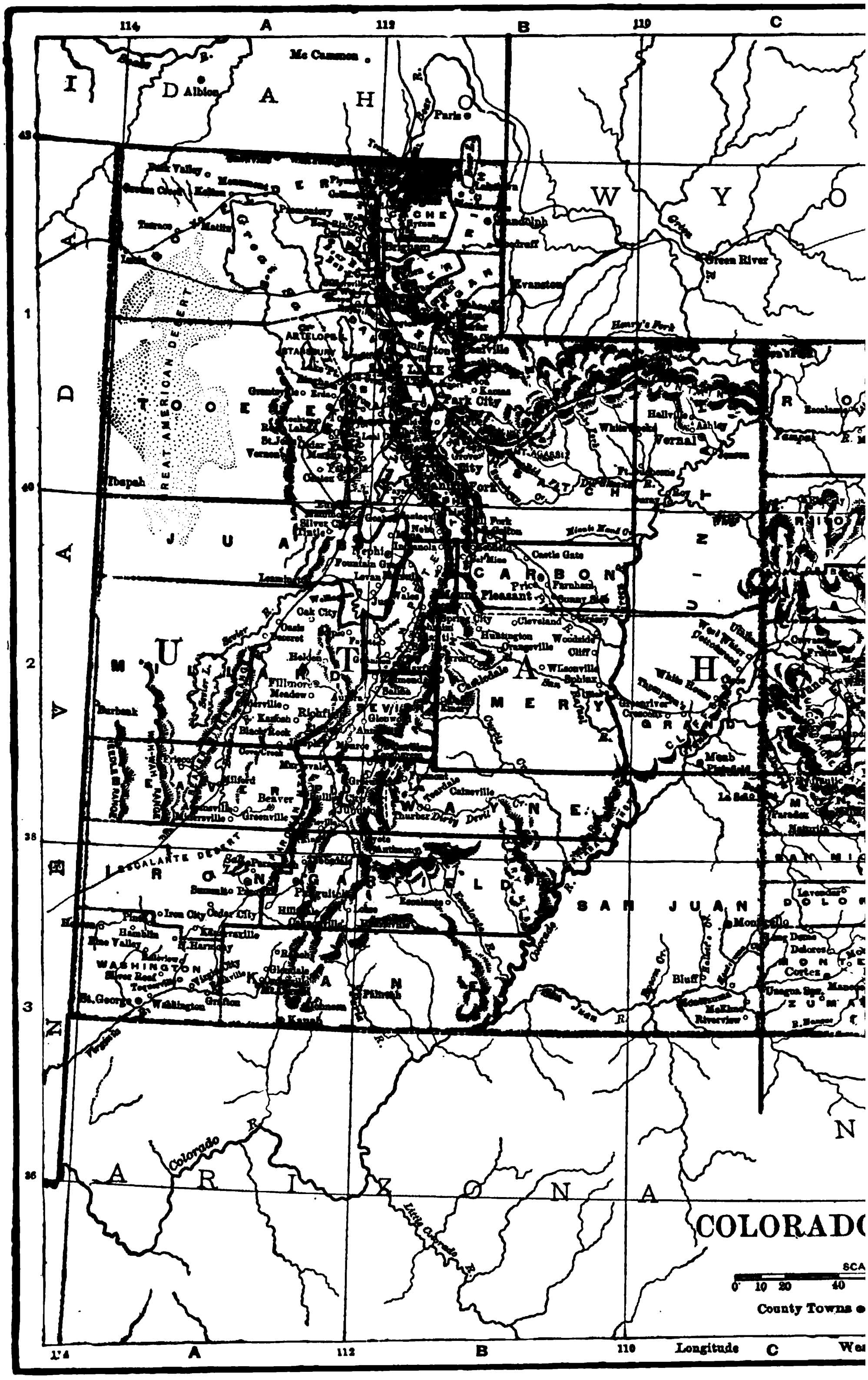
Mining. In 1901 the commercial value of the silver mined was $6,456,480—a decided gain over any preceding year. About two-thirds of this was obtained from lead ores, and the largest part of the remainder from copper ores. The value of the gold produced in 1901 was $3,690,200, which was also much larger than the output for any year excepting 1900. The gold is obtained from quartz mines. The production of lead for 1901, 49,870 short tons, was the largest output reached in any year, and over twice that for 1894. The State ranks third in this production. The output of coal has increased continuously in amount since 1896, being 1,322,614 short tons in 1901, or over three times the yield for the former year. From Carbon County is obtained 95 per cent. of the total product. The production of copper fluctuated about a low figure prior to 1898, in which year the output amounted to only 3,750,000 pounds. But there was a rapid increase following that year, the output in 1901 being 20,116,979 pounds. Increasing quantities are obtained from low-grade ores. The State ranks fifth in copper-mining. Salt is manufactured at Salt Lake, the yield in 1901 being 334,484 barrels, valued at $326,016. Limestone and sandstone, brick and tile, and Portland cement are products of some value.

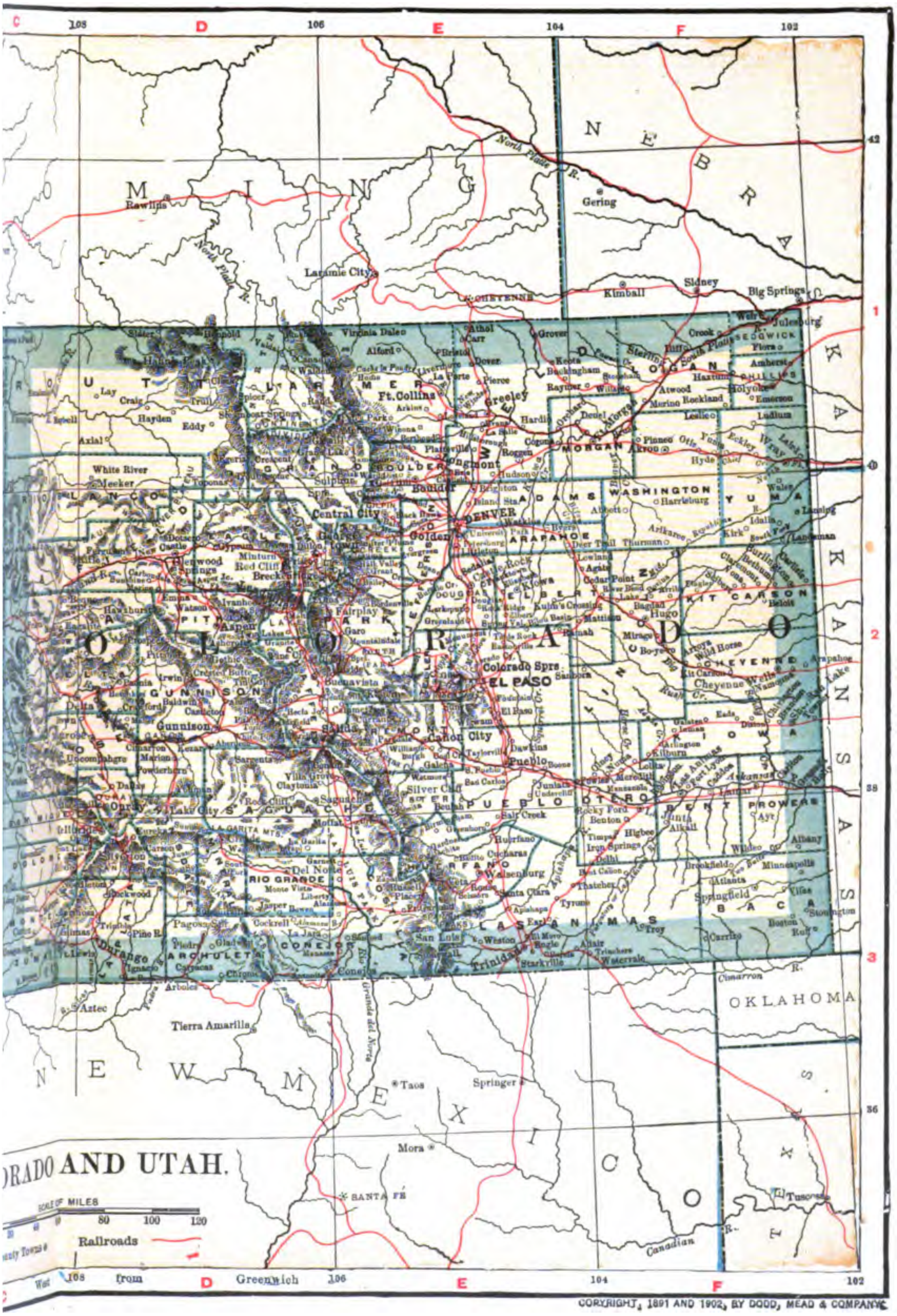
Agriculture and Stock-Raising. Agriculture is the chief occupation. Utah was the first of the Rocky Mountain States to develop this industry. Its success was dependent almost wholly upon irrigation, and it was the first State to demonstrate the possibilities of the irrigation system in the United States. The system has developed under conditions here not found elsewhere, and with much more satisfactory results to those who share its advantages. The planning and control of the system by the Mormon authorities made harmonious coöperation possible, and an economic distribution of the water without disputes over rights to its use. The land was divided into areas convenient for cultivation by a single household, so that there was a remarkable uniformity in the size of irrigated farms, and their average size was much less than for any other State. With the recent occupation of extensive unimproved areas, however, the average size of farms for the State has greatly increased. The average in 1860 was 30.2 acres, in 1880, 69.3 acres, and in 1900, 212.4 acres. The total farm area in 1900 (4,116,951 acres) was over three times that in 1890, and the improved area in 1900 (1,032,117 acres) was nearly twice that in 1890. In general, the northern counties have the largest farms. In 1900, 91.2 per cent. of the farms were owned by their operators.

The western half of the State belongs to the Great Basin, and nearly 90 per cent. of the irrigated land is within this basin. Salt Lake Valley in the north central part of the State contains a large part of the irrigated area. Almost the entire water supply is drawn from streams. Wells afford a very small amount. In 1899 there were 629,293 acres irrigated. Of the 686,374 acres of crops in that year, 537,588 acres were irrigated. Hay is the crop most extensively grown and also the most valuable crop, alfalfa being the principal variety. In 1899, 86.9 per cent. of the alfalfa was irrigated. Wheat and oats are the most widely grown cereals and both made large gains between 1890 and 1900. Of the area in oats 93 per cent. was irrigated, but only 57.4 per cent. of that in wheat. Much attention is given to vegetables, particularly potatoes and sugar-beets. The entire acreage of the latter and 94 per cent. of the former were irrigated. Prior to 1890 little attention was given to orchard fruits,

AREA AND POPULATION OF COLORADO BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Arapahoe	E 2	Denver	4,723	132,135	153,017
Archuleta	D 3	Pagosa Springs	1,209	826	2,117
Baca	F 3	Springfield	2,531	1,479	759
Bent	F 3	Las Animas	1,497	1,313	3,049
Boulder	E 1	Boulder	751	14,082	21,544
Chaffee	D 2	Buenavista	1,224	6,612	7,085
Cheyenne	F 2	Cheyenne Wells	1,787	534	501
Clear Creek	E 2	Georgetown	425	7,184	7,082
Conejos	D 3	Conejos	1,407	7,193	8,794
Costilla	E 3	San Luis	1,746	3,491	4,632
Custer	E 2	Silvercliff	696	2,970	2,937
Delta	C 2	Delta	1,201	2,534	5,487
Dolores	C 3	Rico	1,000	1,498	1,134
Douglas	E 2	Castlerock	889	3,006	3,120
Eagle	D 2	Redcliff	1,586	3,725	3,008
Elbert	E 2	Kiowa	1,852	1,856	3,101
El Paso	E 2	Colorado Springs	2,134	21,239	31,602
Fremont	E 2	Canon City	1,478	9,156	15,636
Garfield	C 2	Glenwood Springs	3,049	4,478	5,835
Gilpin	E 2	Central City	130	5,867	6,690
Grand	D 1	Sulphur Springs	1,873	604	741
Gunnison	D 2	Gunnison	3,277	4,359	5,331
Hinsdale	D 3	Lake City	1,003	862	1,609
Huerfano	E 3	Walsenburg	1,537	6,882	8,395
Jefferson	E 2	Golden	858	8,450	9,306
Kiowa	F 2	Sheridan Lake	1,780	1,243	701
Kit Carson	F 2	Burlington	2,168	2,472	1,580
Lake	D 2	Leadville	393	14,663	18,054
La Plata	D 3	Durango	1,848	5,509	7,016
Larimer	D 1	Fort Collins	4,337	9,712	12,168
Las Animas	E 3	Trinidad	4,802	17,208	21,842
Lincoln	F 2	Hugo	2,553	689	926
Logan	F 1	Sterling	1,733	3,070	3,292
Mesa	C 2	Grand Junction	3,309	4,260	9,267
Mineral	D 3	Creede	880	......	1,913
Montezuma	C 3	Cortez	2,113	1,529	3,058
Montrose	C 2	Montrose	2,290	3,980	4,535
Morgan	F 1	Fort Morgan	1,264	1,601	3,268
Otero	F 2	Lajunta	2,042	4,192	11,522
Ouray	D 2	Ouray	557	6,510	4,731
Park	E 2	Fairplay	2,084	3,548	2,998
Phillips	F 1	Holyoke	677	2,642	1,583
Pitkin	D 2	Aspen	983	8,929	7,020
Prowers	F 3	Lamar	1,602	1,969	3,766
Pueblo	E 2	Pueblo	2,447	31,491	34,448
Rio Blanco	C 2	Meeker	3,249	1,200	1,690
Rio Grande	D 3	Del Norte	1,331	3,451	4,080
Routt	C 1	Hahns Peak	6,980	2,369	3,661
Saguache	D 2	Saguache	2,769	3,313	3,853
San Juan	D 3	Silverton	438	1,572	2,342
San Miguel	C 2	Telluride	1,310	2,909	5,379
Sedgwick	F 1	Julesburg	535	1,293	971
Summit	D 2	Breckinridge	603	1,906	2,744
Teller	E 2	Cripple Creek	551	......	29,002
Washington	F 1	Akron	1,074	2,301	1,241
Weld	E 1	Greeley	3,918	11,736	16,808
Yuma	F 1	Yuma	1,162	2,596	1,729


114
A
112
B
110
C
I D A H O
Albion
Mc Cammon
Paris
W Y O
Green River
Evanston
Henry's Fork
N E V A D A
GREAT AMERICAN DESERT
TOOELE
JUAB
MILLARD
BEAVER
IRON
WASHINGTON
KANE
GARFIELD
WAYNE
SEVIER
SANPETE
EMERY
CARBON
GRAND
SAN JUAN
UINTAH
Park City
Vernal
Ashley
Ibapah
Nephi
Levan
Leamington
Oak City
Oasis
Deseret
Holden
Fillmore
Meadow
Kanosh
Richfield
Black Rock
Milford
Beaver
Greenville
Minersville
Burbank
Castle Gate
Price
Farnham
Pleasant
Spring City
Cleveland
Huntington
Orangeville
Woodside
Castledale
Greenriver
Moab
La Sal
Monticello
Bluff
McElmo
Riverview
Escalante
Escalante Desert
Iron City
Cedar City
Kanarraville
Hamblin
Pine Valley
St. George
Washington
Grafton
Kanab
Paragonah
Panguitch
Hillsdale
Parowan
Hanksville
Cainesville
Thurber
Fremont
Loa
Torrey
Colorado R.
Green R.
San Juan R.
Dirty Devil R.
Virgin R.
Sevier R.
Dolores
Cortez
Mancos
Paradox
Naturita
Lavender
Ouray
Yampa R.
N
A R I Z O N A
COLORADO
SCA
0 10 20 40
County Towns ●
36
38
40
42
Longitude
West



RADO AND UTAH.

COPYRIGHT, 1891 AND 1902, BY DODD, MEAD & COMPANY

AREA AND POPULATION OF UTAH BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Beaver	A 2	Beaver	2,580	3,340	3,613
Boxelder	A 1	Brigham	5,436	7,642	10,009
Cache	A 1	Logan	1,181	15,509	18,139
Carbon	B 2	Price	1,596	.....	5,004
Davis	A 1	Farmington	285	6,751	7,996
Emery	B 2	Castledale	4,336	5,076	4,657
Garfield	A 3	Panguitch	5,103	2,457	3,400
Grand	C 2	Moab	3,759	541	1,149
Iron	A 3	Parowan	3,284	2,683	3,546
Juab	A 2	Nephi	3,300	5,582	10,082
Kane	A 3	Kanab	4,368	1,685	1,811
Millard	A 2	Fillmore	6,664	4,033	5,678
Morgan	A 1	Morgan	599	1,780	2,045
Piute	A 2	Junction	744	2,842	1,954
Rich	A 1	Randolph	1,050	1,527	1,946
Salt Lake	A 1	Salt Lake City	768	58,457	77,725
San Juan	B 3	Monticello	8.025	365	1,023
Sanpete	B 2	Manti	1,561	13,146	16,313
Sevier	B 2	Richfield	1,880	6,199	8,451
Summit	B 1	Coalville	1,937	7,733	9,439
Tooele	A 1	Tooele	6,901	3,700	7,361
Uinta	C 2	Vernal	5,190	2,762	6,458
Utah	B 1	Provo City	2,123	23,768	32,456
Wasatch	B 1	Heber	4,147	3,595	4,736
Washington	A 3	Saint George	2,457	4,009	4,612
Wayne	B 2	Loa	2,372	.....	1,907
Weber	A 1	Ogden	544	22,723	25,239

but the conditions are favorable to them, and between 1890 and 1900 there was a great increase in every variety of fruit trees. In the latter year there were 715,778 apple trees, amounting to 40.1 per cent. of the total number of orchard trees. Weber and other northwest counties have the largest number of trees. Probably no State in the Union has a larger average yield per acre for all crops than has Utah.

The following table shows the acreage of the principal crops for the census years indicated:

	1900	1890
Hay and forage	388,043	....
Wheat	189,235	84,505
Oats	43,394	22,747
Corn	11,517	5,782
Barley	8,644	6,440
Potatoes	10,433	....
Sugar beets	7,546	....

The plateau region in the eastern half of the State and the valleys of the central region afford sufficient pasturage to support a considerable grazing industry. Every decade since 1850 shows an increase in the number of dairy cows and other cattle, horses, and sheep. Sheep-grazing seems to be assuming the most prominent place. The value of the wool product in 1899 was $2,599,638. The average weight of the fleece increased from 5.0 pounds in 1890 to 6.4 pounds in 1900. The following table shows the number of domestic animals on farms and ranges. In 1890 there were 78,047 head of cattle, 22,243 horses, and 922,730 sheep on ranges which are not included in this table.

ANIMALS	1900	1890
Dairy cows	65,905	45,982
Other cattle	277,785	154,284
Horses	115,884	65,057
Mules and asses	3,004	1,554
Sheep	2,553,134	1,014,176
Swine	65,732	27,046

MANUFACTURES. This industry is confined principally to production for the local market. However, there has latterly been a decided growth in the industry, the value of products (including custom work and repairing) having increased from $8,911,047 in 1890 to $21,156,183 in 1900. In the latter year there were 6615 persons engaged in the industry, and the capital invested was $14,650,948. The most important branch is the smelting and refining of lead ore. The flour and grist mill products in 1900 were valued at $1,829,840, the beet-sugar products at $1,037,355, and the butter and cheese at $713,889. Salt, malt liquors, and boots and shoes are other products of some importance. The value of products of railroad construction and repair shops in 1900 was estimated at $1,306,591. A large number of the industries are centred in Salt Lake City, the value of products for that place in 1900 being $6,109,409.

TRANSPORTATION AND COMMUNICATION. The Union Pacific was the first railway to enter Utah, and since its advent in 1869 the development of the State has been very rapid. The total railway mileage in 1876 was 500; in 1894, 1347; and in 1902, 1875. The most important railway lines are the Rio Grande Western and the Oregon Short Line, extending north and south through the central part of the State, and the Union Pacific, passing through the northern portion. There are no navigable streams.

BANKS. The history of banking in Utah is very uneventful. Private bankers became active toward 1860, and from 1860 to 1870 some banks were organized under the Territorial law. The first national bank was established in 1872 with Brigham Young as its president. Like all the economic activities of the Mormons, the banks were controlled by the Church authorities, and the high development of mutual confidence which characterizes the members of this faith has saved the banks from crises. Even during the hard times of 1893 the banks of Utah all remained solvent. State banks are more numerous and do a much larger business than the national banks. Savings banks have existed since 1873.

The condition of the banks in 1902 is shown in the following table:

	National banks	State banks.
Number	12	29
Capital	$1,680,000	$2,780,000
Surplus	430,000	5,851,000
Cash, etc	1,303,000	4,220,000
Deposits,	8,188,000	26,513,000
Loans	4,356,000	23,805,000

GOVERNMENT. The Constitution of Utah was adopted by a vote of the people in 1895. An amendment may be proposed in either House, and upon receiving the approval of two-thirds of the members elected to each House, it is submitted to the people, and if a majority of the electors voting thereon approve, it becomes a part of the Constitution. In a similar manner a constitutional convention may be called, but the changes proposed by the convention must be submitted to the people for approval. The suffrage and also the right to hold office are granted to women as well as men. Voters must be citizens twenty-one years of age and have resided in the State one year, in the county four months, and in the precinct sixty days. The Constitution admits of laws requiring of voters a property qualification in order to vote special taxes or create indebtedness. All general elections, except for municipal and school officers, are held on the Tuesday after the first Monday in November. Utah sends one member to the National House of Representatives. The capital is Salt Lake City.

LEGISLATIVE. The Legislature meets in biennial sessions, limited to sixty days, except in cases of impeachment. Members receive not more than $4 per day, and mileage limited to ten cents a mile. Representatives are elected for two years and Senators for four years. The latter can never exceed thirty in number, and the former must never be less than twice nor more than three times the number of Senators. The Lower House impeaches and the Senate tries all cases of impeachment.

EXECUTIVE. The Governor, Secretary, Auditor, Treasurer, Attorney-General, and Superintendent of Public Instruction are elected for four years. The Secretary of State and president pro tempore are in the line of succession to the Governorship in case of vacancy, and serve until a new Governor can be elected at the next general election. The pardoning power, unless otherwise provided for by law, rests with a board consisting of the Governor, justices of the Supreme Court, and the Attorney-General. The Governor may call extra sessions of the Legislature, and exercises a veto which may be overruled by a two-thirds vote of the members elected to each House.

Judicial. The Supreme Court consists of three elected judges, but after 1905 the number may be increased to five, who shall serve six years. The State is divided into seven judicial districts (subject to change), in each of which from one to three district judges are elected for four years. Other courts inferior to the Supreme Court may be established by law.

Local Government. The Legislature provides a uniform system of county government. Precinct and township organization, the incorporation, organization, and classification of cities and towns are established by general laws.

Finances. The finances are in a satisfactory condition. At the time of admission into the Union the State assumed the small debt of the Territory, amounting to $700,000, and additional bonds to the amount of $200,000 were issued. The debt remained at the same level, but the 5 per cent. bonds were refunded by 3½ per cent. and 3¼ per cent. obligations. The income of the State is derived mainly from a general property tax and sale of public lands. In 1902 the total receipts were $1,409,256, of which the property tax supplied 65 per cent. and the sale of public lands 27 per cent. The expenditures were $1,349,654, of which almost 50 per cent. were for school purposes. The cash in the treasury on January 1, 1903, was $565,259, more than half being in the school fund.

Militia. In 1900 there were 53,755 men of militia age. The organized militia, in 1901, numbered 526 men.

Population. The population by decades has been as follows: 1850, 11,380; 1860, 40,273; 1870, 86,786; 1880, 143,963; 1890, 207,905; 1900, 276,749. In 1900 the State ranked forty-third among the States of the Union. There were 3.4 inhabitants per square mile. The population is largely limited to the irrigated or mining districts. In 1900 there were 141,687 males and 135,062 females. The foreign born numbered 53,777; Indians, 2623; negroes, 672; Chinese, 572; and Japanese, 417. The English, Danes, and Swedes are the most numerous of the Europeans. Salt Lake City, the capital and largest city, had 53,531 inhabitants in 1900; Ogden, 16,313; Provo City, 6185; and Logan, 5451.

Religion. Utah is the centre of Mormonism. About three-fourths of its population is allied with the Mormon Church. (See Mormons.) In recent years many other denominations have entered the State, of which the Catholics and Methodists are numerically the strongest.

Education. The present public school system was introduced in 1890, superseding in large part the many sectarian institutions then in existence. The control of the public schools is in the hands of the Superintendent of Public Instruction, elected for four years, and a board of education. The expenditures for school purposes in 1902 aggregated nearly $1,460,000. In the census year 1900 the population of school age numbered 106,513, of which 64,925, or about 60 per cent., were in attendance. The illiterates at that date formed 3.1 per cent. of the population ten years of age and over. The report of the State Superintendent for 1902 showed a school attendance of 76,466. The leading institutions are the University of Utah (q.v.), at Salt Lake City; Brigham Young College, at Logan; and the Agricultural College of Utah, also at Logan. A State normal college is maintained in connection with the State University, and there is a branch normal school at Cedar City.

Charitable and Penal Institutions. There is an insane asylum at Provo City. A reform school is located at Ogden, and a penitentiary at Salt Lake City.

History. The first white explorers of Utah were Spaniards, sent by Coronado (q.v.), who reached the Colorado River in 1540. Two Franciscan friars seeking a direct route to the Pacific went from Santa Fe to Utah Lake in 1776. In the winter of 1824-25, James Bridger, a trapper, seeking to determine the course of the Bear River, discovered the Great Salt Lake. Other trappers followed in 1825-26, and established posts in the region. Later immigrants to Oregon and California passed through without halting. The real history begins when the Mormons (q.v.), despairing of peace in Missouri or Illinois, determined in 1846 to move west. The Mexican War was then in progress, and in June, 1846, while the emigrants were encamped at the site of Council Bluffs, Iowa, a Mormon battalion was raised for the conquest of California, which then included the whole southwestern part of the United States. The march of the Mormon people was slow and painful. On July 21, 1847, the advance guard reached the present site of Salt Lake City. Other bands rapidly followed, and by 1852 they numbered 15,000. The United States did not obtain possession of the territory until the Treaty of Guadalupe Hidalgo, in 1848, and did not immediately provide for its government. At first the Church officers were the rulers, but with the coming of non-Mormons in 1849 the State of Deseret was organized, a constitution adopted, and a delegate sent to the United States Congress asking admission. Congress refused to admit the State, but organized the Territory of Utah (September 9, 1850), with boundaries much more extended than at present, and Brigham Young (q.v.) was appointed Governor. He soon quarreled with the other Territorial officers sent out, and the General Assembly adopted the laws of the State of Deseret. In 1854 and again in 1856 admission to the Union was sought. There was constant wrangling, owing partly to the fact that many officers sent out were incompetent and partly because the authorities of the Church were determined to rule at any cost. In 1857 it was determined that Young should be superseded as Governor, and for this purpose it was considered necessary to make a display of military strength, as Young had defied the authority of the United States. A force under General Harney (afterwards succeeded by Colonel Albert Sidney Johnston) started from Fort Leavenworth. Though there was no fighting of consequence, the Mormons, by burning supply trains, disabling and stampeding teams, setting fire to the grass, etc., prevented the entranee of the troops into Salt Lake City until June, 1858. They found the city deserted and ready to be set on fire if necessary. For some years troops were kept in garrison here, but the attention of the general Government was occupied with the Civil War, and little was accomplished, though an act designed to break up polygamy was passed in 1862. Meanwhile the Perpetual Emigration Fund had been organized in 1849 and thousands of proselytes were brought from Europe. The incoming of non-Mormons was viewed with disfavor. See MOUNTAIN MEADOWS MASSACRE.

After the Civil War, the opening of the transcontinental railroad in 1869 brought more 'gentiles,' and further efforts to enforce the laws were made by some officers, but with little success. The Mormon grand juries refused to indict and the other juries to convict. The death of Young in 1877 apparently made no difference in the condition of affairs. It was finally decided that the only way to break the power of the Church was to deprive its members of political power. The Edmunds Bill in 1882 disfranchised all polygamists, and abolished most of the offices in the Territory. Control was given to a commission of five men. Within two years 12,000 were disfranchised and the indignation was so great that troops were sent in 1885 in fear of an uprising. Continued agitation for Statehood brought no result, and meanwhile, after it had been held constitutional that juries might consist entirely of non-Mormons, prominent officials were convicted and sent to the penitentiary. A more stringent act was passed in 1887, the corporation of the Mormon Church, and the Perpetual Emigration Fund were abolished, and their property escheated. By 1890 468 men had been convicted of polygamy, and President Woodruff of the Mormon Church issued a manifesto declaring that the Church no longer countenanced polygamy, and his action was approved by a General Conference of the Church. This was followed in 1891 by the formation of political parties, on national lines, and in 1893 amnesty was declared to all offenders who could show that they had not broken the law since 1890. Congress passed an enabling act for Statehood in 1894, a constitution was formed on March 6, 1895, was adopted in November, and the State was admitted January 4, 1896. The Constitution forbids polygamy and allows woman's suffrage. Since admission it has been claimed that the people are going back to their old practices, and in 1900 Brigham H. Roberts was not allowed to take his seat in the United States House of Representatives, because of a charge of polygamy.

The State has voted in but two Presidential elections. The silver question was the sole issue in 1896, and the vote was cast for the Democratic Silver candidate. In 1900 by a small majority Republican electors were chosen.

GOVERNORS OF UTAH

STATE OF DESERET

Brigham Young	1849-51

TERRITORY OF UTAH

Brigham Young	1851-57
Alfred Cumming	1857-61
John W. Dawson	1861
Frank Fuller (acting)	1861-62
Stephen S Harding	1862-63
James Duane Doty	1863-65
Charles Durkee	1865-69
Edwin Higgins (acting)	1869-70
S. A Mann (acting)	1870
J. Wilson Shaffer	1870
Vernon H. Vaughan (acting)	1870-71
George L. Woods	1870-74
S. B. Axtell	1874-75
George B. Emery	1875-80
Eli H. Murray	1880-86
Caleb W. West	1886-89
Arthur L. Thomas	1889-93
Caleb W. West	1893-96

OF THE STATE

Heber M. Wells	Republican	1896—

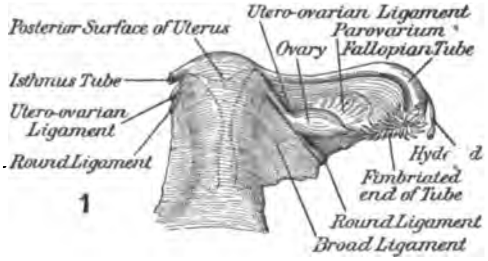
Consult: Nichols, *Mineral Resources of Utah* (Pittsburg, 1873); Bancroft, *History of the Pacific States* (San Francisco, 1889); Jones, *Utah* (New York, 1902); and the works named in the bibliography under the article MORMONS.

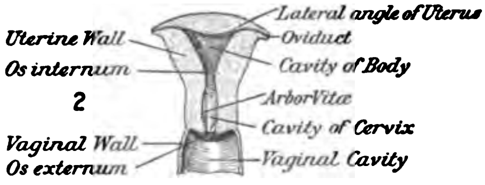
UTAH, UNIVERSITY OF. A State institution of learning for both sexes at Salt Lake City, Utah, founded in 1850 as the University of the State of Deseret. After one session it was discontinued until 1867, owing to lack of funds and patronage. A new charter was secured in 1894, when the present corporate title was assumed. In the same year the university received a grant of 60 acres on the Fort Douglas Reservation and the Legislature appropriated $300,000 for buildings on the new site. The departments are the School of Arts and Sciences; the State School of Mines, established by the State Legislature in 1901; the State Normal School; and a preparatory department. Students are admitted on examination or on certificate from accredited schools. In 1903 the attendance was 745, the teaching force numbered 30, and the library contained 21,300 volumes and 11,500 pamphlets. The value of the university property was estimated at $350,000 and the gross income at $85,000.

UTAH LAKE. The largest fresh-water lake in Utah, situated 30 miles southeast of the Great Salt Lake, into which it discharges through the river Jordan (Map: Utah, B 1). It is about 25 miles long and eight miles wide, and lies on the extreme eastern border of the Great American Basin, at the western base of the Wasatch Range, and at an altitude of 4505 feet. It is surrounded by mountains on all sides, but receives its principal drainage from the east. The chief town on its shores is Provo City.

UTE, ūt, or U'TAH. An important tribe of Shoshonean stock (q.v.), who formerly occupied the mountain region of western Colorado and eastern Utah, with portions of the adjacent territory on the north and south, and extended their hunting and raiding expeditions far down into the plains. They were subdivided into bands, of which the principal were the Tabequache, Muache, Capote, Wiminuche, Yampa, and Uinta. They seem to have been the original nucleus of the Shoshonean stock, as commonly recognized, occupying a central position and having no tradition of any earlier home. They were usually at peace with their neighbors and kindred on the north and west, the Shoshoni, Banak, and Piute, and also assumed a protectorship over the Jicarilla, but carried on constant and relentless warfare with the Navajo and with all the tribes of the plains. They were a restless, warlike, and aggressive people, living entirely by hunting and on wild fruits and roots, and, like other tribes of the same stock, were democratic in their tribal life, with centralized or hereditary chiefship and careless of ceremonial. Their native arts were simple, but by trade with the Navajo and Piute they obtained blankets and baskets, while from the Mexicans, and by raids on other tribes, they procured herds of horses, sheep, and cattle. Their ordinary dwelling was a brush shelter or small tipi. In their family relations the husband seems to have had more importance than among the Plains tribes. The Ute made their first treaty with the Government in 1850, and by various subsequent treaties were limited in range until the entire body, with the exception of the Southern Ute, were removed to the present reservation in Utah. In 1881 they were officially reported to number 3974. In 1901 they had been reduced to 2589, of whom 941 were on the Southern Ute Reservation in southern Colorado, the remainder on the Uinta Reservation in northeastern Utah. Those in Utah were fairly prosperous, while the majority of those remaining in Colorado were in a miserable condition, owing to neglected treaty promises and the desert character of the land upon which they are compelled to live. See Plate of AMERICAN INDIANS, under INDIANS.

UTERUS (Lat., womb), or WOMB. A flattened, pear-shaped organ, lying behind the symphysis of the pubes in the female human being, and constituting her principal generative organ. It consists of a body, a base or fundus, a neck or cervix, and a mouth. It lies in the line of the axis of the outlet of the pelvis (q.v.), with base directed upward and forward, and the neck directed slightly backward. In the unimpregnated condition it is about three inches in length, two in breadth, and one in thickness. On laying it open, or exploring its interior by the introduction of an instrument through the *os uteri*, its cavity is found to be very narrow, and to contain a little mucus. Its walls are nearly half an inch thick, and are mainly composed of muscle fibres running irregularly in all directions except round the *os*, where they make a partial sphincter. This muscular coat, which constitutes the bulk of the organ, is covered externally with a serous coat, derived from the peritoneum, and is lined internally by a mucous coat continuous with that of the canal called the *vagina*, by which the interior of the womb communicates with the outer surface of the body. The neck or *cervix* of the womb is distinguished from the body by a well-marked construction. The mouth, or *os*, projects slightly into the vagina. This opening is nearly round in the virgin, and transverse after parturition. It is of considerable size, and is named the *os uteri externum;* it leads into a narrow canal which terminates at the upper end of the *cervix* in a smaller opening, the *os internum*, beyond which is the shallow triangular cavity of the womb, of which it forms the lower angle, while the two upper angles, which are funnel-shaped, constitute the beginning of the Fallopian tubes, or oviducts, whose apertures are so small as only to admit the passage of a fine bristle. The blood-vessels and nerves enlarge in a very remarkable way during pregnancy, so as to adapt themselves to the increased wants of the organ, which at the ninth month of utero-gestation weighs from two to four pounds. The name *appendages to the uterus* or *adnexa* is given to the Fallopian tubes and ovaries, which are inclosed by the lateral folds of the peritoneum called the broad ligaments. The uterus is suspended in the pelvic cavity in such a way as, by its mobility, to escape concussion from without or disturbance from the varying conditions of the surrounding viscera, while at the same time to allow of its vastly increasing in bulk with comparatively little discomfort when pregnancy occurs. This is effected by several reduplications of peritoneum, containing variable quantities of fibrous and muscular tissue, and known from their form or connection as the *broad*, the *round*, the *utero-sacral*, and the *utero-vesical* ligaments. During pregnancy the uterus increases gradually to the end of the ninth month, when it contracts and expels the fœtus. The organ then atrophies, contracts, and resumes nearly its initial size and shape.





1, Uterus and broad ligament as seen from behind, the latter being spread out. The isthmus tube, the utero-ovarian ligament, and the round ligament of the left side have been cut short. 2, Sectional diagram of the uterine cavity as seen from the front.

The chief functions of the uterus relate to menstruation (q.v.), insemination, gestation, and parturition. See EMBRYOLOGY; FŒTUS; OBSTETRICS; OVARY; STERILITY; UTERUS, DISEASES OF THE.

UTERUS, DISEASES OF THE. The causes of uterine disease may be divided into those which are operative before marriage, those which arise during married life, and those which depend upon child-bearing or its sequels. These causes thus embrace neglect of out-of-door life and physical development; improper dress; imprudence during menstruation; excessive mental strain; the prevention of conception and the production of abortion; the neglect of precautions after childbirth or the failure to repair lacerations occurring during delivery; disease communicated during sexual intercourse; and habitual constipation. Utter disregard of weather or temperature during menstruation and a continuance of the nervous tension of study during this period are grave and undermining agencies. Too great activity after parturition in women heretofore unaccustomed to physical labor interferes with the normal degeneration of the enlarged uterus, a process requiring six weeks for its accomplishment. Tight bandaging, 'to preserve the figure,' results in bending the large uterus back into the hollow of the sacrum and fixing it in a displaced position, which is the reason for subsequent pain, weariness, constipation, and much discomfort. The modern obstetrician is prepared to close lacerations immediately after delivery, to complete the surgical repairs necessary, and to prevent infection through bleeding surfaces. A very fruitful source of uterine disorder lies in the prevention of conception and the procurement of abortion. The resort to drugs locally applied has resulted often in chronic endometritis, and abortions leave a patulous uterine mouth inviting infection, even if hemorrhage has not proved debilitating, or peritonitis has not supervened, or retained shreds of fœtal or placental tissue have not started a fatal septicæmia. Gonorrhœa (q.v.) is a frequent and dangerous cause of uterine disease. Constipation, so often a result of sheer neglect in young women, contributes to displacement of the uterus by the mass of fœcal matter retained in the rectum with resulting dysmenorrhœa, sterility, and endometritis.

Endometritis is an inflammatory affection of the mucous lining of the uterus, and may be confined to either the neck or the body of the viscus, or may affect both. It is caused by exposure during menstruation, direct injury, infection from the vagina (notably gonorrhœal), excessive sexual intercourse, or suppressed menstruation. Its symptoms are pain, weight, and oppression in the pelvic cavity and in the back, frequent griping in the urinary bladder and rectum, burning in the vagina, and a leucorrhœal discharge of an irritating and suppurating character. It may be complicated by similar disease in adjoining structures. It may last but a few weeks or continue for years.

Chronic metritis, or *hyperplasia*, gives rise to similar symptoms, with dyspepsia, headache, and languor added, besides nausea and vomiting in some cases. The pathological condition present is an enlargement of the uterus through increase of its connective tissue.

Laceration of the cervix of the uterus consists of a tearing in the wall of the neck of the organ during labor. It gives rise to all the symptoms noted under endometritis, and also to neuralgic pains in the uterus and discomfort in walking. It may be unavoidable during delivery, and most frequently occurs as a result of precipitate labor, or manual or instrumental delivery. It is a frequent cause of lifelong suffering and distress, which operative interference, in the vast majority of cases, relieves at once.

Fistulæ are common affections of the uterus, which give great discomfort. A fistula may be an unnatural opening from the bladder into the uterus, from the bladder into the vagina, from the bladder into the rectum, or from the uterus into the rectum. In each case the passage of urine or fœcal matter through an improper channel is a symptom, as well as pain, pruritus, eruptions, and excessive irritation. The operation devised and improved by James Sims (q.v.), after unsuccessful suggestions had been made in France, England, and Germany, has revolutionized the topic and rendered these distressing conditions susceptible to cure.

Displacements of the uterus, while not diseases, give rise to diseased conditions of much moment, by preventing the escape of menstrual blood, by interfering with the uterine circulation, by causing pressure and friction, and by producing sterility. The varieties are anteflexion, in which the uterus is bent forward upon itself; anteversion, in which the whole uterus is tilted forward; retroversion, in which the uterus is tilted backward; retroflexion, in which the uterus is bent backward upon itself; lateroversion and lateroflexion, in which the uterus is tilted or bent upon itself sideways; inversion, in which the fundus of the uterus is turned partly or entirely inside out; and prolapsus, or descent, in which the uterine body slips downward into the pelvis to a lower depth than normal, and even, in the worst degree, causes a protrusion of the cervix at the vulvar orifice.

Menorrhagia is a condition in which menstruation is profuse, and an actual hemorrhage occurs at the menstrual period. *Metrorrhagia* is the occurrence of profuse menstruation or of a hemorrhage from the uterus in the interval between menstrual periods.

Cancer of the uterus is fairly frequent. The symptoms are pain through the pelvis; tenderness upon walking or moving, or during coition; menorrhagia and metrorrhagia; discharge of a very offensive fluid from the uterus; pallor and loss of strength and flesh; and fistulæ. Septicæmia may result from it, as well as cellulitis, peritonitis, phlebitis, and embolism, and metastatic deposits elsewhere. The treatment is amputation of the organ or its complete removal by knife or electro-cautery. All uterine diseases demand treatment at the hands of an intelligent and skillful practitioner. There can be no suggestions for domestic practice in these cases, beyond copious vaginal injections of fairly hot water, thrown against the cervix. Consult Kelly, *An American Text-book of Gynæcology, Medical and Surgical* (Philadelphia, 1900).

U'THER. King of Britain and father, by Igerna, of Arthur (q.v.).

U'TICA. The county-seat of Oneida County, N. Y., 95 miles west by north of Albany; on the south bank of the Mohawk River, on the Erie Canal, and on the New York Central and Hudson River, the New York, Ontario and Western, the Delaware, Lackawanna and Western, the West Shore, the Rome, Watertown and Ogdensburg, and the Mohawk and Malone railroads (Map: New York, E 2). It is finely situated at an elevation of about 430 feet, and is regularly laid out. Noteworthy are the city hall, the United States Government building, the State Armory, the Young Men's Christian Association building, the Utica Free Academy, and the Masonic Home. The Public Library has 30,000 volumes. Other collections include the Oneida Historical Society Library with more than 7200 volumes, the Utica Law Library, the Utica State Hospital Medical Library, the Young Men's Christian Association Library, the Deutscher Leserverein, and the Faxton Hall Library. Utica has been termed 'the city of charities' because of the number of its charitable institutions, the value of their property, and the large amount annually expended for their maintenance. The more important of these institutions include the Home for the Homeless, Home for the Aged, Utica Orphan Asylum, Saint Vincent's Protectory, and the City, Homœopathic, Faxton's, and Saint Luke's hospitals. A State lunatic asylum also is here.

Utica is of considerable prominence as a commercial and industrial centre. It is in a rich dairy-farming country and is widely known for its large output of cheese. Hop-growing and the cultivation of roses are other important industries of the surrounding district. In manufacturing Utica ranks eighth among the cities of the State, its various industrial establishments in the census year 1900 having $19,289,502 invested capital and a production valued at $19,550,850. The leading manufactures are men's clothing, hosiery and knit goods, cotton and woolen goods, steam fittings and heating apparatus, foundry and machine-shop products, malt liquors, lumber products, and saddlery and harness. For maintenance and operation the city spends annually about $650,000. The chief items are: schools, $200,000; fire department, $75,000; municipal lighting, $63,000; police department, $41,000; interest on debt, $33,000; streets, $30,000; and garbage removal, $23,000. The net debt in 1902 was $664,085; and the assessed valuation of property (real and personal) was $32,754,592. The population in 1820 was 2972; in 1850, 17,565; in 1880, 33,914; in 1890, 44,007; in 1900, 56,383.

Utica was settled about 1786 on the site of Fort Schuyler, which in 1758 had been erected to control the fording place of the Mohawk. Until 1798, when it was incorporated as a town under its present name, Utica was known as 'Old Fort Schuyler.' It was reincorporated in 1805, and received a city charter in 1832. Its growth was slow until after the completion of the Erie Canal in 1825. Consult: Bagg (editor), *Memorial History of Utica* (Syracuse, 1892); and Brown, Butcher, and Goodale, *Outline History of Utica and Vicinity* (Utica, 1900).

UTICA (Lat., from Gk. Οὐτική, *Outikē*, Ἰτύκη, *Itykē*). An ancient city of Africa, at the northwest extremity of the Gulf of Tunis, and about 20 miles from the city of Tunis. It was one of the oldest Phœnician settlements on the African coast, though the traditional date of its foundation (about B.C. 1100) seems to rest on no good evidence. Like the other Phœnician cities, it acknowledged the supremacy of the Carthaginians, though its position was rather that of ally than subject. It was captured by Agathocles in his invasion of Africa at the beginning of the third century B.C., and played an important part in the Punic Wars. Early submission to Rome in the Third Punic War was rewarded with a large share of Carthaginian territory. In the war between Cæsar and Pompeius it became famous as a rallying point of the Pompeians after the battle of Pharsalia, being occupied by Cato, and the scene of his suicide after Cæsar's victory at Thapsus. Utica became a free city under Cæsar and it received further privileges from Augustus. It was destroyed by the Arabs toward the end of the seventh century. Its rather insignificant ruins lie west of the river known to the ancients as Bagradas. The site of the city was anciently on the shore about 27 Roman miles northwest of Carthage, but on account of changes in the coast line, caused by the river Bagradas, the spot is at present inland.

UTIEL, o͞o-tē-āl′. A town of Valencia, Spain, 45 miles west of the city of Valencia (Map: Spain, E 3). The principal manufactures are wine, brandy, silk and linen fabrics, and pottery. Municipal population, in 1900, 11,560.

UTILITARIANISM (from *utilitarian*, from *utility*, from Lat. *utilitas*, usefulness, profit, from *utilis*, useful, from *uti*, to use). The name of the theory of ethics (q.v.) that adopts, as the criterion of right and wrong, of good and bad, the tendency of an action to produce the happiness of mankind. John Stuart Mill claims to have coined the word, which was suggested to him by the use of the term 'utilitarian' in Galt's *Annals of the Parish*.

The doctrine of utility is opposed to all those theories that refer us to some internal sense, feeling, or sentiment, for the test of right and wrong; a test usually described by such phrases as a moral sense, conscience, innate moral distinctions, whence utility is sometimes termed the *external* or objective standard of morality. It is also opposed to the view that founds moral distinctions on the mere arbitrary will of God. Again, it is opposed to the view that the pleasure-giving value of an act to the agent is the test of its goodness or badness (individualistic hedonism).

The utilitarian theory is distinctively a modern theory. All ancient hedonisms were individualistic; i.e. the happiness of the agent and not that of his fellow beings was regarded as the ultimate end of all rational action. This is true even of Christianity in so far as it is hedonistic, for the ultimate appeal in Christianity is to the individual's desire for everlasting happiness, although along with this appeal is another to a benevolent desire for the happiness of one's neighbors. In the Greek hedonistic systems whatever regard is paid to the well-being of others is in the last analysis based on the fact that such consideration for others brings pleasure to one's self. In modern times Hobbes is the foremost representative of this ancient or individualistic hedonism. Hutcheson (q.v.) is perhaps the first writer on ethics who advocated the principle of the 'greatest happiness of the greatest number,' in this way transcending the limitations of egoism (q.v.). There are utilitarian tendencies in Hume (q.v.) and even in Locke. Abraham Tucker (q.v.) is also to be mentioned as one of the early Utilitarians (1705-74). But Paley (q.v.) and Bentham (q.v.), especially the latter, are to be credited with giving such popular expression to this view that it became current in all centres of English thought. With Bentham the theory was used as a foundation, not merely of ethics, but also of political and legal reforms. Having in view the necessity of sacrificing smaller interests to greater, or, at all events, of not sacrificing greater interests to smaller, he described the ethical end as 'the greatest happiness of the greatest number.' He illustrated the doctrine by setting it in opposition to *asceticism*, and to sympathy and antipathy. Asceticism he interpreted to mean the principle that pleasure should be forfeited, and pain incurred, without expectation of any compensation. By the principle of sympathy and antipathy he means "the principle which approves or disapproves of certain actions, not on account of their tending to augment the happiness, nor yet on account of their tending to diminish the happiness of the party whose interest is in question, but merely because a man finds himself disposed to approve or disapprove of them: holding up that approbation or disapprobation as a sufficient reason for itself, and disclaiming the necessity of looking out for any extrinsic ground." According to the utility principle of Bentham, there are "four sanctions or sources of pain and pleasure," the physical, the political, the moral, and the religious. The physical sanction is the groundwork of all the others. "In a word, the powers of nature may operate of themselves; but neither the magistrate, nor men at large, *can* operate, nor is God in the case in question *supposed* to operate, but through the powers of nature." Bentham attempted to work out a calculus of pleasures, in which he took account of the intensity, the duration, the certainty, the propinquity or remoteness, the fecundity (= 'chance of being followed by sensations of the same kind'), the purity, and the extent of pleasures and pain.

Paley advocated a form of utility. He made the will of the Deity, enforced by future rewards and punishments, the impelling motive to duty; but in determining what that will was, in particular cases, he included a reference to the tendency of actions to benefit others.

John Austin, in his *Province of Jurisprudence Determined*, has contributed a lucid exposition and a strong defense of the principle of utility. John Stuart Mill has devoted a separate work to the subject, and may be considered as the ablest champion of the doctrine since Bentham's time. His addition to the theory consists in recognizing a distinction of quality as well as of intensity between pleasures. While Bentham had maintained that "the quality of pleasure being equal, push-pin is as good as poetry," Mill contended that "it is better to be a human being dissatisfied than a pig satisfied," i.e. human discontent is better than swinish pleasures. Since Mill's day utilitarianism has been combined with the theory of evolution to form a basis for morality. Among the English advocates of the combination the best known are Herbert Spencer (q.v.) and Sir Leslie Stephen (q.v.).

The objections urged against hedonism (q.v.) in general bear against utilitarianism. In addition there are arguments which tell against utilitarianism exclusively. Utilitarianism is not practicable for the reason that it is impossible to estimate the pleasures which in the long run will flow from any course of action. Human nature changes very radically in its capacity to get pleasures from certain objects. Time was when the cruel torturing of a captured enemy brought intense delight to a whole tribe, and was regarded with complete indifference by the rest of mankind, with the exception of the victim's fellow-tribesmen. Now such treatment of captives would shock all Christendom. Many jokes and jests that centuries ago were appreciated with great relish would fall flat now in good society, and some of them would inflict considerable discomfort upon the hearers. Gladiatorial combats and bull fights are differently regarded at different times and places. These are only a few of the large number of instances which might be adduced to show how impossible it is to foresee the hedonic effect of actions when a distant future is taken into account. The uncertainties of calculation are great enough when only the pleasure of the agent is concerned (see HEDONISM), but if the pleasures of all mankind, present and future, so far as they are in any way affected by our actions, must be estimated before we can properly pronounce upon the morality of any act, then moral judgment becomes impracticable.

Perhaps, however, the error of utilitarianism can be made most patent by asking the question, Why should I seek the greatest pleasure of the greatest number? Unless I desire that end for itself or desire it because the attainment of it conduces to some other desired end, it would be impossible to make me regard that end as good or the pursuit of it as right. The savage is not cosmopolitan in his ethics (hence he is not utilitarian), because he is not cosmopolitan in his sympathies. The normal civilized man is not uniformly cosmopolitan in his ethics (hence he is not a utilitarian), because he is not uniformly cosmopolitan in his sympathies. The average good man cares more for his father and mother, for his wife and children, than he does for strangers. For this reason he does not regard the happiness of a stranger as equally obligatory upon him to pursue as the happiness of some member of his immediate family. But when this ordinary man undergoes an unusual change of heart and comes to care more, say, for the opinion some supernatural being is supposed to have of him than for his own kith and kin, then in order to win that good opinion he may sacrifice the happiness of his family to that of strangers. It is not true, therefore, that we should be benevolent because only thus can we secure the greatest happiness of the greatest number; but, on the contrary, we try to make 'the greatest happiness of the greatest number' an end because we are benevolent. But our benevolence is only a part of our endowment, varying in relative intensity in different persons, and in the same person at different times. In addition to our desire for the well-being of others we have an almost countless number of desires for other objects. The realization of these desires enters into the question of the chief end of man. There is no reason why one desire should be singled out from the complex of desires in order that its realization may be considered the highest good of man—unless this desire is the most imperious of them all and its non-satisfaction conduces more to the agent's discontent with life than any other cause. Now there is no question that without some social features the life of most human beings would be robbed of much of its attractiveness, but there is very little evidence to show that the ordinary man would be greatly disturbed for a long time by any failure on the part of humanity at large to get the greatest amount of happiness possible. And yet, though universal benevolence is not thus a very strong characteristic of our kind at large, still history seems to show that the reach of the average man's sympathetic interests is larger now than in tribal times. But, however much greater it may be now than formerly, free play given to one's impartially benevolent impulses can hardly be regarded as the highest good of man.

Consult: Hutcheson, *Inquiry Concerning the Original of Our Ideas of Beauty and Virtue*, etc. (London, 1725); Tucker, *Light of Nature Pursued* (ib., 1768-74); Bentham, *Introduction to the Principles of Morals and Legislation* (ib., 1789); Paley, *Principles of Moral and Political Philosophy* (ib., 1785); J. S. Mill, *Utilitarianism* (ib., 1863); Sidgwick, *The Methods of Ethics* (ib., 1874); Grote, *Examination of the Utilitarian Philosophy* (ib., 1870); Birks, *Modern Utili-*

tarianism (ib., 1882); T. H. Green, *Introduction to Hume* (Oxford, 1875); id., *Prolegomena to Ethics* (ib., 1883); Watson, *Hedonistic Theories from Aristippus to Spencer* (Glasgow, 1895); Gomperz, *Kritik des Hedonismus* (Stuttgart, 1898); Stephen, *The English Utilitarians* (London, 1900); Albee, *English Utilitarianism* (ib., 1901). See also ETHICS.

UTO'PIA (Neo-Lat., from Gk. *οὐ*, *ou*, not + *τόπος*, *topos*, place). An impracticable scheme of social regeneration, an imaginary state of society, an ideal country where all things are perfect. The term as thus used goes back to the *Utopia* of Sir Thomas More (q.v.), a political romance descriptive of a happy society on an imaginary island. This work originally appeared in Latin at Louvain in 1516 under the title *De Optimo Reipublicæ Statu deque Nova Insula Utopia* and was translated into English by Bishop Burnet. The romance was a disguised exposition of a liberal and rationalistic theory of society, including certain principles that would now be called socialistic. Far from being so unique that it might have been expected to give a generic name to ideal commonwealths, the *Utopia* is only one of a long series of similar dreams. First in order of both time and importance is Plato's *Republic*, the chief thought of which is that ideal justice can be established only in a commonwealth where every individual has that place in the division of labor for which he is fitted by nature, and where all affairs are directed by the men of superior wisdom, whose government should extend even to provision for the nurture and education of children brought into the world under a system of stirpiculture. Plutarch's *Life of Lycurgus* idealizes the socialistic State of the Spartans. Bacon's *New Atlantis* (1624-29) pictures a commonwealth in which all men attain happiness through a regulation of life by science. Campenella's *City of the Sun* (1637) portrays a community where all live together in public buildings, working only four hours a day, and despising idleness. Very different in its ideal of society is James Harrington's *Oceana* (1656), a book which emphasizes the Aristotelian idea of a natural aristocracy among men, and develops fully the thought of personal liberty established under parliamentary government. It exercised a great influence upon the minds of American political thinkers during and after the Revolution. Other Utopias more or less influential have been the *Voyage en Salente* in Fénelon's *Télémaque;* Cabet's *Voyage en Icarie* (1840), a Utopia of the modern proletariat; Bulwer Lytton's *The Coming Race* (1871); Bellamy's *Looking Backward* (1889); William Morris's *News from Nowhere* (1890), in which joy in beautiful work is to be the true social bond; and Hertzka's *Freiland* (1891). Some of the more important works mentioned, excepting Plato's *Republic*, and the nineteenth-century romances, are reprinted in Morley's *Ideal Commonwealths* (1886).

UTRAQUISTS (from Lat. *utraque*, nom. pl. neu. of *uterque*, both, either). A name at first given to all those members of the Western Church, in the fifteenth century, principally followers of John Huss, who contended for the administration of the Eucharist to the laity under both kinds; but in later times restricted to one particular section of the Hussites, although all the members of that sect alike claimed this as a fundamental principle of their Church discipline. See CALIXTINES; HUSSITES.

UTRECHT, ū'trĕkt. *Dutch pron.* ụ'trĕkt. A province of the Netherlands, bounded by the Zuyder Zee and the provinces of North Holland, Gelderland, and South Holland (Map: Netherlands, D 2). Area, 534 square miles. It lies mainly in the Rhine basin and has a low, level surface. Agriculture, dairying, and cattle-breeding are the principal industries. Population, in 1899, 251,034. Capital, Utrecht (q.v.).

UTRECHT. A city of the Netherlands, the capital of the province of the same name. It is situated 22 miles southeast of Amsterdam (Map: Netherlands, D 2). The Rhine separates here into the Old Rhine and the canalized Vecht, and there are also canals traversing the city. Utrecht is a strong outpost of defense for Amsterdam. The site of the former fortifications surrounding the city are (since 1830) lined by watercourses and agreeable promenades. Quaint houses and artistic street scenes are to be seen at every hand, the Gothic being freely in evidence. The famous Gothic cathedral (thirteenth century), rising in the centre of the town, is the most prominent edifice, and marks the spot where the church of Dagobert and of Saint Willebrord stood. It ranked high for architectural beauty until the nave, which has never been restored, fell in in 1674 as the result of a storm, thus separating the tower from the rest of the church. The tower, 338 feet high, was begun in 1321. It has a chime of 42 bells. The graceful Gothic cloisters which merit notice connect the cathedral with the famous university (q.v.). The 'Pope's house,' built by Pope Adrian VI., a native of Utrecht, now contains municipal offices. The splendid archiepiscopal museum is noteworthy for its rare vestments, embroideries, carvings, etc., all representative of Christian art. The Museum Kunstliefde is in the building of the Society of Arts and Sciences, and contains a few notable pictures by Scorel. The art-industrial Museum van Kunstnyverheid, the Fleshers' Hall, and the mint possess some interest. On the east extends the Malieban—a triple boulevard shaded by six rows of large old lime trees. It leads to Hoogeland Park, and to the Antiquarian Museum, which is housed in an edifice of Greek pattern. The museum contains many varieties of antiquities belonging to Roman, Germanic, and mediæval times. The interesting royal Château of Soestdyk, where the reigning family often sojourns, is a few miles to the north.

Besides the university with its numerous collateral institutions, including laboratories and a museum, Utrecht has the only veterinary school in the Netherlands, and an important meteorological observatory. The Historical Society and the Society of Arts and Sciences hold a leading rank. The large university library is in the palace erected for King Louis Napoleon. The military hospital was founded by Napoleon I. Utrecht has manufactures of cloth, woolens, silk, velvet, carpets, carriages, organs, cigars, chemicals, etc. The population in 1901 was 106,800. About one-third of the inhabitants are Catholics. In addition to the Roman Catholic archbishop, Utrecht is the seat of an old Catholic (Jansenist) archbishop.

HISTORY. Utrecht was the Roman *Trajectum ad Rhenum*. The Bishopric of Utrecht, founded at the close of the seventh century by Saint Willibrord, rose to importance under the patronage of the German emperors, and the bishops became prominent in their capacity as temporal princes among the feudal lords of the Holy Roman Empire. The city of Utrecht, having become very flourishing, succeeded in emancipating itself from the rule of the bishops. About 1527 the bishopric and city passed into the possession of the Emperor Charles V. In 1559 the see was elevated to the rank of an archbishopric. The Union of Utrecht, a compact joining together the seven provinces which were to form the Dutch Republic, was concluded in 1579. The famous Treaty of Utrecht, terminating the War of the Spanish Succession, was signed here in 1713.

UTRECHT, PEACE OF. The general designation for a number of treaties which were concluded between the years 1713 and 1715 and brought to an end the War of the Spanish Succession. (See SUCCESSION WARS.) On April 13, 1713, peace was signed at Utrecht between France on the one hand and England, Holland, Prussia, Savoy, and Portugal on the other. Spain concluded treaties with England, July 13, with Savoy, August 13, with Holland, June 26, 1714, and with Portugal, February 6, 1715. The treaty between France and Austria was signed at Rastadt, March 7, 1714, and this was adhered to by the Empire at Baden in September. The most important provisions of the various treaties were as follows: Philip V., of the House of Bourbon, was recognized as King of Spain and the Indies, but it was stipulated that the crowns of Spain and France should never be united in the same person. Spain ceded to the Emperor Naples, the Milanese, Sardinia, and the Netherlands; to England, Gibraltar and Minorca; to Savoy, the island of Sicily; to Prussia, Upper Gelderland. France surrendered its hold on Lorraine and gave up Kehl, Breisach, and Freiburg on the right bank of the Rhine, but retained Alsace with Strassburg. To England it ceded Acadia, Hudson's Bay, and Newfoundland, with the reservation of certain rights of fishery on the Banks. Louis XIV. recognized the title of the House of Hanover to the English throne, and agreed to expel the Pretender from France. The Electors of Cologne and Bavaria, allies of France, were restored to their possessions. The Dutch were given the right of garrisoning eight frontier towns in the Austrian Netherlands as a barrier against any future aggressions on the part of France. Their commercial interests were favored by the provision which kept the Scheldt closed to trade. The Prussian King received confirmation of his royal title and the Duke of Savoy was raised to the kingly dignity. (See SARDINIA, KINGDOM OF.) England, in addition to its conquests from France and Spain, received from both valuable trading privileges, and in the so-called Assiento (q.v.) with the latter laid the basis of an extremely lucrative slave trade with Spanish America. The Peace of Utrecht effected the most important political rearrangement in Europe between the Peace of Westphalia and the Congress of Vienna. Though France received far more favorable terms than it might have been forced to accept, Europe was secured from its ambitions by the aggrandizement of its neighbors, Austria and Holland on the north, Prussia on the east, and Savoy on the southeast. With Utrecht the last two Powers definitely entered upon the line of development which was to result in a united Germany and a united Italy in the nineteenth century. From Utrecht dates England's marvelous commercial and colonial growth. Consult *Histoire du congrès et de la paix d'Utrecht comme aussi de celle de Rastatt et de Bade* (Utrecht, 1716).

UTRECHT, UNIVERSITY OF. A national university of the Netherlands, founded in 1636 upon the basis of a 'schola illustris,' established two years earlier by the city and province of Utrecht. During the French occupation in 1672 the university was closed. It was reopened in 1674 with only 22 students, which number, however, increased to about 230 by the early part of the eighteenth century. Nearly one-third of the students came from Great Britain. The university experienced another decline of fortune in 1811-13, as a result of the Napoleonic conquest, but has flourished since its reopening as a royal university in 1815. (For its place in the national system of education, see the section on the *Netherlands* under UNIVERSITY.) It is divided into five faculties—theology, law, medicine, mathematics and science, and letters—and had, in 1902-03, 1012 students. There are twenty-one laboratories and clinics, and an observatory, in connection with the university. The library contains about 250,000 volumes, exclusive of pamphlets and dissertations. The annual budget of the university is about 500,000 florins.

UTRERA, o͞o-trā′rȧ. A town of the Province of Seville, Spain, 17 miles southeast of the city of that name, with which it has railway connection (Map: Spain, C 4). The town is situated in a fertile plain sloping to the Guadaira River. It has manufactures of spirits, flour, and soap. Portions of its mediæval walls are still standing. Population, in 1900, 14,318.

UTSUNOMIYA, o͞ot′sṳ-nô-mē′yȧ. The capital of the Prefecture of Tochigi, Japan, 66 miles north of Tokio (Map: Japan, F 5). Population, in 1899, 32,069.

UVULA. See PALATE.

U′WINS, THOMAS (1782-1857). An English painter in oil and water colors, born in London. He began his career as an engraver, and in 1798 he entered the schools of the Royal Academy. At first a water-colorist, after a visit to France in 1817, to paint vintage scenes, he devoted himself also to oils. He was also an illustrator, and in 1820 he went to Scotland to make drawings for Scott's works. In 1824-31 he made studies in Italy for genre folk scenes, upon which his reputation chiefly rests. Uwins was made academician in 1838, librarian of the Academy in 1844, and in 1847 keeper of the National Gallery. Among his paintings in the National Gallery are "Le Chapeau de Brigand," a "Vintage in Southern France," and "Sir Guyon Fighting for Temperance," all in oils. In the South Kensington Museum are, besides a number of oils, the well-known water-colors "Little Housewife" (1810), "Hay Harvest," and the "Coronation of George IV." For the Queen's Pavilion in Buckingham Palace Gardens he painted a fresco of the "Lady in Comus." Consult: Nevins, *Recollections of Thomas Uwins* (London, 1858); and Uwins, *Memoir of Thomas Uwins* (ib., 1858).

UYEDA, o͞o′yȧ-dȧ. A town in the Prefecture of Nagano, Japan, situated in the central part of Hondo, 21 miles southeast of Nagano (Map: Japan, F 5). It manufactures chiefly silks. Population, in 1898, 24,114.

UYUK, o͞o-yo͞ok′. A noted archæological site in Asia Minor. See EYUK.

UZ (Heb. *'ûṣ*). The home of the patriarch Job (Job i. 1), as yet unidentified. Job is called one of the Sons of the East (ver. 3), but this indefinite term applies to the inhabitants of the great territory lying between Syria and Mesopotamia and stretching from the Euphrates into the Arabian Desert. His friend Eliphaz (q.v.) came from Teman, doubtless in Edom, and with this agrees the Septuagint colophon to the book, that Uz lies on the border between Edom and Arabia. The neighborhood of Edom as the abode of wise men (cf. OBADIAH) makes a proper scene for the dialogue, while Uz appears in the eponymous genealogy of the Seirites, the aboriginal inhabitants of Edom (Gen. xxxvi. 20 sqq.). On the other hand Uz appears as an Aramaic people, being a son of Aram (Gen. x. 23) or a nephew of Abraham (Gen. xxii. 21). This might place Uz far in the north, and Delitzsch on Assyriological evidence would locate it near Palmyra. Josephus finds Uz in the neighborhood of Damascus (an Aramaic region), and an ancient tradition places Job's home in the Hauran. If the name be associated with the Aramaic tribes, it is to be borne in mind that those tribes were migratory, and geographical terms connected with them most variable. Also the biblical reference may be part of the ancient tradition concerning Job, which the author simply adopted without special intention. Consult the commentaries, especially Wetzstein's note to Delitzsch.

UZ, o͞ots, JOHANN PETER (1720-96). A German poet, born at Ansbach and educated at Halle, where he became the friend of Gleim and Götz. He was in his day prominent in the group of German anacreontic poets. His works include *Sieg des Liebesgottes* (1753), *Versuch über die Kunst stets fröhlich zu sein* (1760), and *Poetische Schriften* (1804). Consult: Feuerbach, *Uz, ein biographischer Versuch* (Leipzig, 1866), and Henneberger, *Briefe von Uz an einen Freund aus 1753-1782* (Leipzig, 1866).

UZ′BEKS. A people of the Oxus basin in Russian Turkestan, scattered over a wide area from the frontiers of the Chinese Empire to the Caspian. They are in part nomadic, but have settled in great numbers in the towns and villages. By language they belong to the Turkic stock, but they have a considerable strain of Iranian blood, and possess many elements of Asiatic Aryan culture. The early home of the Uzbeks appears to have been about the northern end of the Caspian Sea, whence they spread as conquerors in the sixteenth century over Balkh, Khiva, Bokhara, Ferghana, and Khokand.

UZZIAH, ŭz-zī′ȧ (Heb. *'Uzziyyāh* or *'Uzziyyāhū*, Yahweh is my strength), or AZARIAH (Heb. *'Ăzaryāh* or *'Ăzaryāhū*, Yahweh has helped). A king of Judah, son of Amaziah (II. Kings xv. 1-7; II. Chron. xxvi.). The relation of the two names is uncertain. They may be practically synonyms, double names occurring in the Davidic line, or possibly one is a textual corruption of the other. Uzziah is assigned a reign of 52 years, the end of which is variously dated within B.C. 740-737. The Book of Kings simply recounts his piety, and that he was smitten with leprosy in the latter part of his reign, his son Jotham becoming regent. The Chronicler represents Uzziah as a successful warrior, subduing the Philistines, and driving back the Arabians and Ammonites, and so extending his boundaries southward. He added to the fortifications of Jerusalem, fortified the Southland, and zealously developed the royal domains. The stroke of leprosy, however, was due to the pride created by his success; he arrogated the right to offer incense in the Temple, and, when he persisted against the high priest, was stricken with the plague. Uzziah was the contemporary of the northern Jeroboam II. (q.v.); in their reigns the Israelitish kingdoms enjoyed political freedom, and, from the notices of the prophets, seem to have gained power and wealth. Isaiah records that his prophetic vision came in the year Uzziah died. Consult the histories of Israel; also, G. A. Smith, *Isaiah* (New York, 1899).

V

V The twenty-second letter and seventeenth consonant of the English alphabet. Its form corresponds to the Roman V, which answers to the Greek upsilon (Υ, *υ*), and that in turn was a variation of the Phœnician (*vau*). In Latin *v* and *u* were used indifferently to represent either the consonantal or the vocalic sound. This confused usage extended into Middle English and the letters were not differentiated until the seventeenth century.

Sound and Philological Value. As a phonetic character *v* in modern English is a voiced labiodental spirant. The sound is produced by the audible friction of the breath passing between the edges of the upper teeth and the lips over which they close. The philological sources of the letters are various. When not initial, English *v* may represent (1) Indo-Germanic *bh*, as in English *love*, German *liebe*, Sanskrit *lubh*, 'to desire;' (2) Indo-Germanic *p*, as in English *over*, German *über*, Sanskrit *upari*. In a few words initial *v* in English represents Indo-Germanic *p* = Anglo-Saxon *f*, as in *vat*, Anglo-Saxon *fæt; vane*, Anglo-Saxon *fana; vixen*, Anglo-Saxon *fixen*. In these cases *v* is due to the influence of the Southern English dialect which gave a voiced sound regularly to the older English *f*. As a rule, initial *v* in English is a sign of a loan-word from Latin or French, as in *villa, voice, vacation*.

As a Symbol and Abbreviation. V in chemistry = *vanadium*. In Roman numerals V = 5; $\overline{\text{V}}$ = 5,000.

VAAL, väl (Dutch, yellow, a partial translation of the native name *Kai Gariep*, 'Yellow River'). The chief tributary of the Orange River in South Africa, regarded by some as the true upper course of the main stream. It rises on the west slope of the Drakensberg, flows west and southwestward on the boundary between the Transvaal and Orange River colonies, and joins the Orange in Cape Colony after a course of between 500 and 600 miles (Map: Cape Colony, K 4).

VAAL RIVER COLONY. The official designation of the Transvaal Colony.

VĀC, väk (Skt., word, voice). In Hindu mythology, the personification of speech, later identified with Sarasvati. She is celebrated in one late hymn of the Rig-Veda, which describes her services to gods and mortals on whom she confers life, wealth, and power. A later meteorological interpretation regards her as 'the voice of the mid-air' or the thunder. Still later she is wooed by the celestial singers, the Gandharvas. Certain attempts have been made to compare Vac as 'the divine word' with the Logos or Word of the fourth Gospel (see Logos), but no mutual influence in the two concepts, although indeed similar in certain respects, has yet been shown to exist, and any parallelism between them is apparently due merely to accidental coincidence. Consult: Hopkins, *Religions of India* (Boston, 1895); id., *India Old and New* (New York, 1901); Macdonell, *Vedic Mythology* (Strassburg, 1897); Müller, *Six Systems of Indian Philosophy* (New York, 1899).

VACA, vä'kȧ, Alvar Nuñez Cabeça de. See Nuñez Cabeça de Vaca.

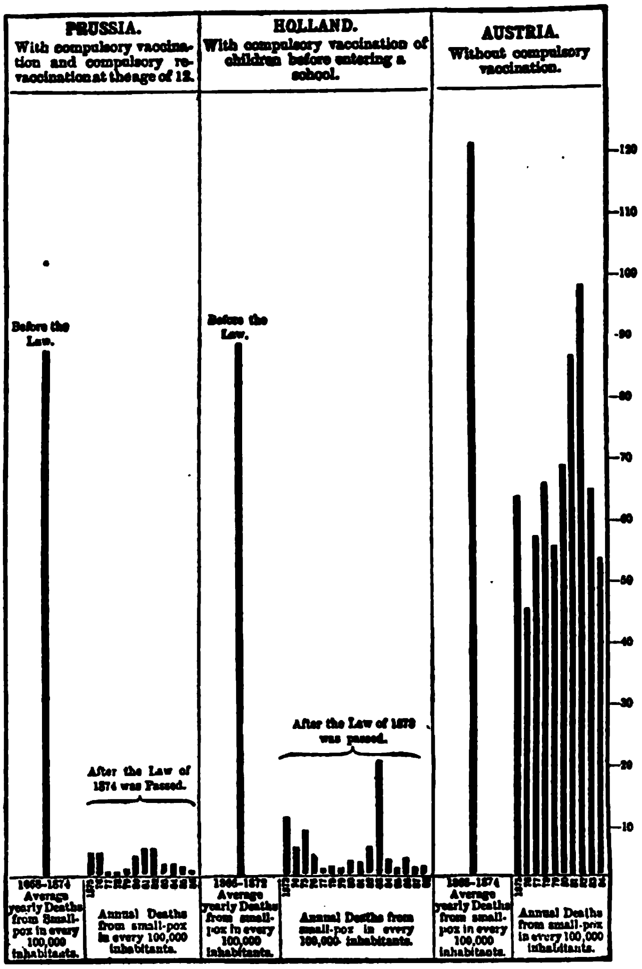
VACANT LOT FARMING. A plan for relieving destitution by permitting those in need to cultivate, under supervision, vacant lots in the city or its suburbs. The scheme originated in 1894 with Hazen S. Pingree, Mayor of Detroit, as a mode of relieving distress during the hard times then prevailing. Several thousand acres of land were offered to the committee appointed by Mayor Pingree, but only 430 acres were accepted. This was prepared for cultivation, and apportioned in small lots among 945 families. Seeds and tools were furnished by the committee, whose superintendent had control of the practical execution of the work. Produce estimated at a value of $12,000 was raised the first year, at an expense to the committee of less than $4000. The pronounced philanthropic as well as financial success of the plan caused its trial in a number of cities during the next year. In New York the work came under control of the Association for Improving the Condition of the Poor. Vacant lots on Manhattan Island being too scattered, offers of land in Long Island City were accepted, and 109½ acres were cultivated. Eighty-four persons held plots averaging seven-tenths of an acre in area. As in Detroit, the chief crop was potatoes. The expenses of the managing committee were $3800 and the total value of crops raised $8800. A feature of the work was a self-supporting coöperative farm of 38 acres. In 1895 vacant lot farms were cultivated in many cities, including New York, Detroit, Boston, Denver, Minneapolis, Omaha, Seattle, and Toledo. It was taken up during the next two years by other cities, including Chicago, Kansas City, and Philadelphia. In the majority of cases the management has been in the hands of private charitable societies, as in New York and Boston. In Denver an independent committee was established; in Philadelphia, the Vacant Lots Cultivation Association has been specially chartered. Finally, the administration has in some instances been in the hands of the municipal authorities, as in Buffalo and in Detroit.

The most important single influence on the success of vacant lot farming is the personality of the superintendent, who must not only be a practical farmer, but must have executive ability, tact in handling people, and commercial knowledge enough to dispose of the crops profitably. The cultivators and their families usually consume a portion of their produce, but the larger part is generally sold in the local market. In most cases land has been lent for the purposes of cultivation, but sometimes, as in Boston, it has been rented. After the initial outlays for preparing the land, supplying seed, tools, etc., have been made, the running expenses do not include much beyond the superintendent's salary. The scheme involves less danger of pauperizing the recipients than do ordinary methods of poor relief, while the work offered is educative in itself. Objection has been raised that it competes unfairly with self-dependent farmers, but while this charge has some weight against vacant lot farming as a permanent establishment, it hardly makes against it as a relief measure in times of economic distress. As a matter of fact financial results have generally been satisfactory. With the return of industrial prosperity, attention to vacant lot farming diminished. Philadelphia is among the few cities in which it has continued to increase. The association cultivated nearly 200 acres in 1902, as against 130 in 1900, and 27 in 1897. The number of persons affected has grown during the same period from 578 to 3775; the value of the total produce in 1902 was $50,000, the total outlay $5557, while the cost per plot sank from $18.25 in 1897 to $7.00 in 1902. The purely educative side of vacant lot farming has recently been developed in the children's 'home gardens,' or city 'farm schools,' which have been started in New York and elsewhere. Consult: New York Association for Improving the Condition of the Poor, *Notes*, vol. i., Nos. 1 and 2 (1895-96); Speirs, Lindsay, and Kirkbride, "Vacant Lot Cultivation," in *Charities Review*, vol. viii., p. 74 (containing bibliography). The Philadelphia and other societies publish reports.

VACATION SCHOOL. A term used, quite arbitrarily, to indicate a school kept in many American cities during the customary summer vacation for the children of the public schools. The term has no reference to the more advanced schools connected with universities and colleges or with popular educational institutions such as the Chautauqua (q.v.), though the motive for the establishment of these more advanced schools may be much the same. The use of the term as well as the institution itself is confined almost wholly to the United States, nor does it have any reference to the ordinary school term as extending through the summer months, as it does in the rural regions of many States. The vacation school is of very recent establishment, save in a few isolated instances, and owes its origin to the work of philanthropic societies in caring for the children of the poor of the larger cities during the extreme heat of the summer. While there are sporadic instances of such schools kept by these societies as early as 1866, when the Old First Church of Boston conducted one, and there are even some instances of school boards providing for such work, as in Newark, N. J., in the same year, the movement has become of importance only since 1898, when the Board of Education of the City of New York took over the schools primarily founded by The Society for the Improvement of the Condition of the Poor. During the summer of 1903 that city provided for 58 such schools, employing 1500 teachers, at a total expense of more than $100,000. At the present time all the large cities of the country and many of the small ones, to the extent of some 200 in all, support such schools. The work of the vacation school is of a much more practical nature than that of the ordinary session and is devoted more to constructive work by the child. Consequently manual training, housekeeping, sewing, together with nature work, local history, and geography, combined with excursions, form a prominent part of the curriculum.

VACCINATION (from *vaccine*, from Lat. *vaccinus*, relating to a cow, from *vacca*, cow; connected with Skt. *vaśā*, cow, from *vāś*, to bellow, or perhaps with *ukṣan*, bull). Inoculation with *vaccinia* or cow-pox, to protect the individual against smallpox.

History. Many years before the time of Jenner it was observed in widely separated localities that accidental infection with cow-pox conferred immunity against smallpox. Immermann quotes Von Humboldt as referring in his travels in the tropics (1803) to the fact that native shepherds in the Mexican Cordilleras believed in the protection afforded by vaccinia against smallpox, and quotes Brun as making a similar statement in reference to the clan of Elihots in Baluchistan. Peasants in different parts of Europe, especially in the southern part of England, in Holstein, Mecklenburg, Hanover, and Saxony were firmly convinced of the fact. In 1763 Dr. Heim, of Saxe-Meiningen, learned through his father, a clergyman, that milkmaids of that country neighborhood asserted their belief in the protective influence of accidental vaccinia against variola. The English physicians Sutton and Fewster, having heard of similar beliefs, inoculated with human smallpox, in 1778, several persons who had been infected with vaccinia, without result. Medical men paid but little heed to their reports, and apparently further experiments were not made by them. A Gloucestershire farmer, Benjamin Jesty, was probably the first European to vaccinate as a preventive. He inoculated successfully his wife and two sons with bovine virus in 1774, having himself secured immunity from variola through accidental vaccinia. It is further reported that Platt, a school teacher near Kiel, vaccinated two children with bovine virus to protect them from an epidemic of smallpox in 1791. But great and lasting credit is no less due to Edward Jenner (q.v.), who in 1768 began a thorough scientific investigation of the matter, and placed the performance of vaccination in its proper place among prophylactic procedures. His experiments were very numerous and accurate. The first mention of individuals occurs in the history of the inoculation on May 14, 1796, of the eight-year-old James Phipps with vaccine virus from a vesicle on the person of a milkmaid, Sarah Nelwes, who had accidentally acquired cowpox. This was probably the first vaccination of a patient with humanized virus of the first generation. Phipps developed a typical case of cowpox, and subsequent attempted inoculation with smallpox virus proved negative. Jenner followed this experiment with an inoculation with bovine virus, and then inoculating from individual to individual for five generations, securing perfect immunity from smallpox in all cases. When both facts were established he put forth his remarkable publication, *An Inquiry into the Causes and Effects of the Variolæ Vacciniæ, Known by the Name of the Cowpox* (1798). This work was translated into Latin and all the European languages, and excited much attention, as well as opposition. Vaccinations were frequent and numerous, and many representative and noted physicians declared themselves as advocates of the theory and practice, in England, France, Austria, Italy, Germany, Switzerland, Holland, Norway, Sweden, Russia, Spain, and Portugal. Dr. Pearson, of London, was at the head of a vaccination institute founded in 1799 by the advocates of Jenner's theory. Jenner founded, in 1803, the Royal Institute for the Extermination of Smallpox, which he directed for many years. Both institutions vaccinated people free of charge and supplied virus for other countries. To Luigi Sacco, a physician of Milan, is due credit second only to Jenner's, for a life-long service in behalf of preventive vaccination, equine and ovine inoculation, and retro-inoculation. To Sacco the world owes the final adoption of animal (bovine) virus in place of humanized virus.



Statistics of the Utility of Vaccination. During the pandemic of smallpox which raged through Europe from 1870 to 1873 an excellent opportunity was afforded for a test of the utility of vaccination. The greater part of the German army had been vaccinated in childhood, and all upon entering service in the Franco-Prussian War. In the French army regular vaccination had not been practiced, and revaccination was neglected. The mortality in the German army was 450, or 58 men to every 100,000; in the French army the mortality was 23,400. At the same time, in Chemnitz, Saxony, 83.9 per cent. of the inhabitants were vaccinated, 8.9 per cent. were unvaccinated, and 7.3 per cent. had previously had smallpox. Altogether, 5.6 per cent. were attacked by the disease during the epidemic, or one case among every 56.7 of the vaccinated to one among every 2.2 of the unvaccinated. That is, the morbidity for the unvaccinated was 26 times greater than that for the vaccinated (Flinzer). To turn to earlier days, between 1796 and 1802 there died on an average annually of smallpox in Bohemia 7663 people out of a total of about 3,000,000. During a period of twenty-four years after the introduction of compulsory vaccination, there died annually of the smallpox 287 people out of a total population of about 4,250,000. In Berlin there died of variola from 261 to 407 persons annually between 1758 and 1809. After this date, when vaccination became compulsory, there died from this same disease from 2 to 40 persons annually between 1810 and 1869. Neglect of revaccination, the importance of which was not then recognized, raised the mortality from variola in Berlin, during 1870 to 1874, to a yearly average of 160.

During a smallpox epidemic in London in 1863, Buchanan and Seaton made an examination of 50,000 children who were exposed to the contagion. Some of the children had never been vaccinated; the large majority had been vaccinated in various manners and degrees. Of every 1000 children without any mark of vaccination, no fewer than 360 had scars of smallpox; while of every 1000 children who had evidence of vaccination, only 1.78 on an average had any such traces: and with regard to the quality and amount of the vaccination, it was found that, of children having four or more cicatrices, only 0.62 per 1000 had any trace of smallpox; while of those who had a single bad mark, 19 per 1000 were scarred by smallpox. Marson, of London, learned from the study of more than 15,000 cases at the smallpox hospital, that while the unvaccinated died at the rate of 37 per cent., the vaccinated have died at the rate of only 6½ per cent., the mortality among those with four or more scars being only 0.55, while that among those with only a single scar was 7.73 per cent.; so that, while the average risk which vaccinated persons run if they do catch smallpox is about 1-6 of the risk run by unvaccinated persons, well-vaccinated persons run less than 1-70 part of the risk.

Dr. S. W. Abbott, of the Massachusetts Board of Health, states that in 1721 nearly 8 per cent. of the population of Boston died of smallpox. From 1800 to 1840 vaccination limited the disease so far that not over 20 deaths resulted from smallpox in that time. Relaxation of the vaccination law in 1836 led to a larger death rate in 1839 to 1841, when 232 died from the disease in Boston. There were no deaths from variola in that city in 1886 or 1895. The control or eradication of the disease, as the statistics show, bears an exact proportion to the thoroughness of vaccination and revaccination. The preceding table, taken from *The Melbourne Argus*, shows very effectively the conditions in Prussia, Holland, and Austria.

TECHNIQUE AND COURSE OF VACCINATION. Virus for vaccination should be procured from well-developed typical vaccine pocks on the abdomen of a healthy young heifer, while they are still in the vesicular stage. The virus may be received upon ivory points or split quills. Another method consists in removing the whole vesicle entire by scraping it from the underlying corium with a spoon, and rubbing this mass with glycerin. The resulting emulsion of pulp is much more active than the dried lymph upon quills. In making use of it, after the person to be vaccinated has taken a bath, the arm or leg chosen for the place of inoculation is washed with carbolic or salicylated cotton, and then with sterile water. Two or three shallow scarifications are made with as many crossing them, the surgeon cutting as deeply as the derma without necessarily drawing blood. After the lymphatic fluid begins to flow from these incisions the vaccine virus is worked into the incisions with the point of the knife or with a very small sterile wooden spatula. After drying thoroughly, the surface is covered with a layer of borated or salicylated cotton, which is to remain on for three days. In the course of 3 to 7 days elevated papules appear, oval or oblong, over the scarifications. These papules are firm, hot, and tender. They are surrounded by a red halo or areola. About the fifth day after their appearance they become vesicles, containing clear fluid, which is vaccine lymph. When humanized virus was used, this was taken from the patient to be used in inoculating another case. These vesicles are called Jenner's vesicles, and somewhat resemble the vesicles of smallpox. Like them, also, they shrink and become umbilicated after the seventh or ninth day; the halo grows darker; pus takes the place of the lymph; pain, itching, swelling, and heat are troublesome. A general fever may be experienced on the fifth day with rapid pulse, rarely slight nausea, and very rarely general malaise. About the ninth or tenth day the pustule dries, and a crust forms. The areola fades. The axillary glands enlarge early at this time and are tender and painful on pressure. Children's symptoms are more pronounced than those of adults. They are fretful, their sleep is broken and their appetite diminished. They have fever, headache, pains in the back, and rarely nausea. The temperature during vaccinia reaches 102.5° F., and rarely runs higher. The crust separates from the arm in 14 days. If the crust be detached by scratching or the chafing of the clothing a second one forms. In all cases scrupulous care must be exercised lest the wound become infected with germs in dust or clothing, or under finger-nails. Serious consequences follow such infection. The wound may be infected with erysipelas, or gangrenous inflammation may set in, causing a very large ulcer. These are not the results of the vaccination, but of subsequent infection; and the same results are often seen following any scratch with a needle or an abrasion upon the hand.

DANGER OF VACCINATION. There is no danger in proper vaccination, if infection is avoided thereafter. All inflammatory reaction beyond that described as occurring in the course of regular vaccinia is due to the introduction of microorganisms by means of dirty instruments or through the admission of dust. There is absolutely no danger of transmitting disease by means of bovine virus. When humanized virus was used there was some danger of transinoculating with syphilis or tuberculosis. Yet this danger was remote, for Councilman is authority for the statement that in the whole history of smallpox there have been collected records of only 50 cases of the conveyance of syphilis through vaccination, with about 700 cases of retransference of the disease. When these figures are compared with the millions of vaccinations performed, the danger may be correctly computed.

COMPULSORY LAWS. Naturally, vaccination, in order to protect, must be universal. All foci from which the disease might spread must be destroyed, and immunity must be secured round about each focus. Every child should be vaccinated during its first year, and all adults should be vaccinated on entering the country, unless presenting sufficient evidence of successful protection previously. Several years after Jenner's discovery, public interest was aroused to a complete understanding of the necessity of compulsory vaccination. Bavaria established a law making vaccination compulsory in 1807. Other States of the North German Confederation followed, and between 1815 and 1832 similar statutes were enacted in Oldenburg, Baden, Württemberg, Saxe-Gotha, Saxe-Meiningen, and Brunswick. Austria in 1801 made vaccination compulsory for school children, but not generally so till 1886. In 1816 Prussia also enacted an indirectly compulsory law. Sweden's compulsory law was put upon the statute books about 1803. Norway and Denmark followed in 1810. After many vicissitudes and changes, Great Britain's law was enacted in 1867. Scotland put herself on record in 1864. Italy, Holland, and Belgium popularized vaccination very early and needed no law. France's decree of 1809 was inoperative and the country has suffered heavily from the want of a compulsory law. The German Empire framed the Imperial Vaccination Law in 1874, and its provisions deserve study and imitation. It provides: (1) Every child shall be vaccinated within the calendar year of its birth, unless it has passed through an attack of variola. (2) Every pupil shall be revaccinated when 12 years of age, if he has not had variola within the past five years. (3) Every vaccinated person must present himself to the physician who vaccinated him between the sixth and eighth day after vaccination. (4) Medical certificates proving successful vaccination at the legal ages shall be preserved by parents and guardians.

Massachusetts enacted laws to regulate vaccination in 1809. Several States followed the example early, notably Rhode Island. In most of the States local or State boards of health formulate regulations under which vaccination is practically compulsory, acting in unison with school boards in excluding all unvaccinated children from the schools. In several of the United States the constitutionality of statutes making vaccination compulsory has been judicially settled. They are held to be a legitimate exercise of the police power for the protection of the public health. A physician who vaccinates a person without the latter's consent, but who is acting under the authority of such a statute or ordinance, is not liable for assault.

In spite of the testimony received from all over the civilized world, anti-vaccinationists flourish in small bodies here and there. The anti-vaccination sentiment had become so strong in England, although confined to a small class, that a measure was adopted in 1898 practically annulling the compulsory vaccination bill of that country. The newer measure provides that any parent may refuse to have his child vaccinated and avoid legal penalty if he satisfies the court that he has conscientious scruples as to the benefits of vaccination. The reaction will come, following some future epidemic of smallpox in Great Britain in which there is great mortality. The agitation against vaccination has been constant since the days of Jenner. In his time it was claimed that the tendency of the inoculation of vaccinia was to cause bovine characteristics to appear in children; that they developed horns, hoofs, and tails, and bellowed like cattle. Less absurd but, in the opinion of leading medical authorities, equally untenable arguments are presented against vaccination to-day.

Revaccination. Jenner believed that the effect of vaccination was perennial: and this belief imperiled the progress of vaccination at one epoch in its history, for vaccinated persons, after several years of immunity, fell victims to smallpox. At one time the mystical number seven seemed to rule the mind, and vaccinia was said to last seven years. In fact, the duration of immunity conferred by vaccination is variable in different people. In a few cases, one vaccination protects for life, and cannot be successfully repeated. In others, a vaccination will 'take' every time it is tried. For safety's sake, a person should be vaccinated every three years, and also whenever threatened by the presence of an epidemic, or when about to travel in a country where smallpox exists or where careful vaccination is not practiced. It is desirable that a careful use be made of a good glycerinated lymph. If this fails, a second trial should be made with vaccine procured from a different source. If this also fails, the person may be considered immune to smallpox for a year.

Substitutes for Vaccination. It has been claimed from time to time by enthusiasts in sanitation that cleanliness and disinfection will control and prevent smallpox. This is an error, as was abundantly proved in a New Jersey town in 1902-03. Until the microörganism causative in smallpox is discovered and its nature is known, no adequate prophylactic or disinfectant measures will supersede vaccination. Were primary vaccination and revaccination carefully practiced, smallpox would be entirely eradicated. See Smallpox.

Consult: Willan, *Vaccine-Inoculation* (London, 1807); Sacco, *Trattato di vaccinazione* (Milan, 1809); Baron, *The Life of Jenner* (London, 1827); *Blue-Book on Vaccination* (ib., 1857); Borne, *Vaccination et revaccinations obligatoires en application de la loi sur la protection de la santé publique* (Paris, 1902); Crandall, "A Century of Vaccination," in *American Medicine* (Philadelphia, Dec. 7, 1901); Immermann, "Vaccination," in Nothnagel's *Encyclopædia of Practical Medicine* (Eng. trans., Philadelphia and London, 1902).

VACH, väch. See VĀc.

VACHEROT, vȧsh'rō', Etienne (1809-97). A French philosopher, born at Langres and educated in Paris, where, after having for several years taught at Châlons-sur-Marne, he was appointed, in 1837, superintendent and maitre des conférence at the normal school by Victor Cousin, his former teacher, whom he succeeded as professor of philosophy at the Sorbonne in 1839. Through his liberal views and especially by the exposition of his philosophical doctrines in the *Histoire critique de l'école d'Alexandrie* (1846-51), he aroused the most violent opposition of the clergy, and in consequence was suspended from his position of superintendent and, after denying allegiance to the Empire in 1852, was deprived of his professorate. Judiciary proceedings and imprisonment resulted from the publication of *La démocratie* (1859). As mayor of the fifth arrondissement of Paris he rendered important services during the siege and the Commune and in 1871 was elected to the National Assembly, where he at first sided with the Liberals, but afterwards joined the Centre and even lent his support to the Broglie Ministry in its ultramontane aspirations. Although withdrawing from political life after the dissolution of the National Assembly, he continued to voice his opinions in his contributions to the *Revue des Deux Mondes*, the severe anti-republican tenor of which created a sensation. Likewise he accentuated his monarchical tendencies in the columns of the *Figaro* and the *Soleil*. Besides his principal work, *La métaphysique et la science*

(2d ed. 1863), containing the development of his philosophical system, he wrote *Essais de philosophie critique* (1864), *La religion* (1868), *La science et la conscience* (1870), *La politique extérieure de la république* (1881), *Le nouveau spiritualisme* (1884), *La démocratie libérale* (1892), and others. For his biography consult Ollé-Laprune (Paris, 1898).

VACUUM. See Air Pump.

VA′DIA′NUS, Joachim (1484-1551). A Swiss reformer and humanist, whose real name was Von Watt. He was born in Saint-Gall, was educated there and in Vienna, and became instructor in classics at the University of Vienna. He returned to Saint-Gall in 1518 to practice medicine. But his great work there was as a reformer and a friend of Zwingli, and it was largely due to his influence that Saint-Gall in 1525-27 went over entirely to the Protestant Church. He took a prominent part in the religious colloquies of Zurich (1523), and of Bern (1528), and corresponded with Luther and Erasmus. He wrote a *Chronicle* of the Abbey of Saint-Gall, edited by Götzinger with Vadianus's other German works (1875-77), and a *Commentarius in Pomponium Melan* (1518). Consult: Geilsius, *J. v. Watt als geographischer Schriftsteller* (Winterthur, 1865); Preffel, *J. Vadian* (Elberfeld, 1861); and Götzinger, *J. v. Watt* (Halle, 1895).

VADIMO′NIAN LAKE (Lat. *Vadimonius Lacus*). A small circular lake in Etruria, now Lago di Bassano. It is famed as the scene of two Roman victories over the Etruscans: the first in B.C. 309 under the dictator Papirius Cursor, the second in B.C. 283 under the consul Dolabella.

VADUZ, vä′dụts. The capital of the Principality of Liechtenstein (Map: Austria, A 3). It is charmingly situated near the right side of the Rhine, at an elevation of 1525 feet, and is on the Feldkirch-Buchs branch of the Austrian State Railway. It is near the Three Sisters (6880 feet). The town has a new Gothic parish church and a castle, which, destroyed by the Swiss in 1499, was rebuilt in 1523-26. The tower of the castle dates from the ninth century. Population, in 1900, 1150.

VAENIUS, *Ger. pron.* vā′nê-ụs; *Lat. pron.* vē′nĭ-ŭs, Otto. See Veen, Octavio van.

VAGA, vä′gȧ, Perino del (1500-47). An Italian decorative painter, born in Florence. His real name was Buanaccorsi. He studied first at Florence under Vaga, and after his removal to Rome he became an assistant of Raphael. As such he assisted in the stucco and arabesque decorations of the Loggia of the Vatican, and executed some of the Scriptural subjects there, which go by the name of 'Raphael's Bible,' and the figures of the planets in the great hall of the Appartamento Borgia, in the Vatican. After the sack of Rome in 1527 he went to Genoa, where he decorated the Doria Palace with stuccoes and frescoes in a style similar to that adopted by Giulio Romano at Mantua, with subjects from classical fables. Later Perino returned to Rome, where he designed a number of façades, hall and church frescoes, and with Daniele da Volterra decorated the Sala Reggia in the Vatican.

VAGANTES, vȧ-găn′tēz (Lat., wanderers). The name given to the itinerant students and clerics of the twelfth and thirteenth centuries, indistinguishable often from the wandering minstrels and clowns who form so picturesque a feature of mediæval life. They are known for the body of satirical literature in Latin which they created, commonly designated as Goliardic literature (q.v.).

VAGARSHAPAT, vȧ-gär′shȧ-pȧt. A village of Russia. See under Etchmiadzin.

VAGINA (Lat., sheath). One of the sexual organs in the female. It is a sheath from four to seven inches long, into which open the uterus and the urethra. It lies behind the bladder and in front of the rectum, and it is lined with mucous membrane. Its external opening is called the vulva, which is formed by the apposition of the two *labia majora*.

VAGRANT. In law, a term of broad application including, in general, all 'idle and disorderly' persons who may become a menace to the public peace or a public burden. The statutes in Great Britain and the United States differ in details, but are elastic enough to cover such diverse classes as unlicensed peddlers, beggars, drunkards, fortune-tellers, prostitutes, notorious criminals, etc., as well as the specific tramp (q.v.).

VAHLEN, vä′len, Johannes (1830—). A German philologist, born in Bonn, where he studied at the university, and became privat-docent in 1854. In 1856 he was made professor in Breslau, in 1858 at Vienna, and in 1874 in Berlin. Among his writings are to be noted especially: *Ennianæ Poesis Reliquiæ* (1854); *Nævii de Bello Punico Reliquiæ* (1854); *Ueber die Annalen Menæchmi* of Plautus (1882); *Ueber die Annalen des Ennius* (1886); *Ulpiani Liber Regularum* (1856); and *Cicero de Legibus* (2d ed. 1883); a critical edition of Aristotle's *Poetics* (3d ed. 1885); *Lorenzo Valla* (2d ed. 1870); *Laurentii Vallæ Opuscula* (1869); and many articles in periodicals. For several years he was co-editor of the periodical *Hermes*, and also of the *Zeitschrift für österreichische Gymnasien*.

VAIGATCH, vī-gäch′. An island in the Arctic Ocean belonging to the Russian Government of Archangel, between the mainland and Nova Zembla (Map: Russia, J 1). It is separated from the latter by the Kara Strait, and from the mainland by the Yugor Strait, while its eastern coast is washed by the Kara Sea. It is about 70 miles long and 25 miles wide, with an area of 1400 square miles, and is traversed lengthwise by a range of mountains belonging to the Ural system. The climate is cold and the vegetation very scanty. The island is permanently inhabited by a few Samoyeds, but in summer it is visited by a number of Russians for its fisheries and the fur-bearing animals.

VAIHINGER, vī′hĭng-ĕr, Hans (1852—). A German philosophical critic, born in Nehren, and educated at Tübingen, Leipzig, and Berlin. He became docent at Strassburg in 1877, and professor in 1883, and in 1884 went to Halle as professor of philosophy and pedagogy. He is known as a critic of Kant. He edited *Kantstudien* (1896 et seq.), and wrote a *Kommentar zu Kants Kritik der reinen Vernunft* (1881-82); *Kant—ein Metaphysiker?* (1889); and *Die transcendentale Deduktion der Kategorien* (1902). His other works include: *Goethe als Ideal universeller Bildung* (1875); *Hartmann, Dühring und Lange* (1876); and the valuable critique *Nietzsche als Philosoph* (2d ed. 1902).

VAIL, vāl, Alfred (1807-59). An American inventor, born near Morristown, N. J. He graduated at the University of the City of New York in 1836. In September, 1837, he entered into partnership with Prof. S. F. B. Morse, agreeing to supply the funds necessary to bring Morse's newly invented telegraph before the public, and to construct a practicable model at his father's iron works at Speedwell, near Morristown, N. J. In January, 1838, the model was completed, and on the 23d was first publicly exhibited at the University of New York. When in 1843 work was begun on an experimental line between Washington and Baltimore, Vail became assistant superintendent. He suggested so many improvements to Morse's original machine, as did also Joseph Henry (q.v.), that the instrument used to-day is the product of the latter two men rather than of its original inventor. Consult Pope, "The American Inventors of the Telegraph," in *The Century*, vol. xxxv. (New York, 1888).

VAILIMA (vī-lē̆'mȧ) **LETTERS.** A series of letters written from Samoa by Robert Louis Stevenson between November, 1890, and October, 1894. They are addressed to Sidney Colvin and contain a varied record of his Samoan exile. The title is derived from the name given by Stevenson to his island home.

VAILLANT, vȧ'yäN', Marie Edouard (1840—). A French socialist, born at Vierzon (Cher), and educated in Paris, where he studied engineering and then medicine, and in Heidelberg, Tübingen, and Vienna. After his return to Paris in 1870 he took a prominent part in the Government of the Commune and served for a time as Minister of Education. He escaped to London on the downfall of the Commune, became a member of the general committee of the Internationale (q.v.), took part in the Hague conference in 1872, and in the same year was sentenced to death *in contumaciam* by the Conseil de Guerre. After the amnesty of 1880 he returned to Paris, and in 1884 was elected to the municipal council, where he advocated the suppression of standing armies, national control of public services, and various socialistic measures. He opposed Boulangism very strongly, at the same time attacking the opportunism of the radical Republicans. In 1893 he secured a seat in the House of Deputies, and he was reëlected in 1898.

VAIR. One of the tinctures in heraldry (q.v.).

VAIŚÉSHIKA, vī-shā'shē-kä. The name of one of the two great divisions of the *Nyāya* (q.v.) school of Hindu philosophy, and probably a later development of the Nyaya itself, properly so called. It agrees with the latter in its analytical method of treating the subjects of human research, but differs from it in the arrangement of topics and more especially in its doctrine of atomic individualities or *viśēṣas*—whence its name is derived.

The topics or categories (*padārthas*) under which Kanada (q.v.), the founder of this system, arranges his subject-matter, are the following six: (1) substance, (2) quality, (3) action, (4) generality, (5) atomic individuality, and (6) co-inherence; and later writers of his school add to these a seventh category, non-existence. These may be explained more precisely. (1) Substance is the intimate cause of an aggregate effect; it is that in which qualities abide, and in which action takes place. It is ninefold—earth, water, light, air, ether, time, space, soul, and *manas*, or the organ of affection. (2) Quality is united with substance; it comprises, according to the commentator, the following twenty-four elements: color, savor, odor, feeling, number, dimension, individuality, conjunction, disconjunction, priority, posteriority, gravity, fluidity, viscidity, sound, understanding, pleasure, pain, desire, aversion, volition or effort, merit, demerit, and self-restitution. Seven of these are later additions to Kanada's list. That qualities belong to the soul is maintained by the Vaiśeshikas in opposition to the Vedantists and Sankhyas. (3) Action consists in motion, and abides in substance alone. (4) Generality abides in substance, quality, and action. It is of two kinds, higher and lower, or genus and species. (5) Atomic individuality resides in eternal substances, by which are meant *manas*, soul, time, space, ether, earth, water, light, and air; it is the ultimate difference, technically called *viśēsa;* such differences are endless; and two atoms of the same substance, though homogeneous with each other, differ merely in so far as they exclude each other. (6) Co-inherence, or perpetual intimate connection, resides in things which cannot exist independently from one another, such as the parts and the whole, quality and the thing qualified, action and agent, species and individual, atomic individuality and eternal substance. (7) Non-existence, the last category, added to the foregoing by the modern Vaiśeshikas, is defined by them as being either non-existence, which is without beginning, but has an end; or non-existence, which has a beginning, but no end; or absolute non-existence, which, extending through all time, has neither beginning nor end; or mutual non-existence, which is the reciprocal negation of identity. The nature of each of these substances, qualities, and actions, is then the subject of special investigation. It is worthy of especial notice that, according to the Vaiśeshika system, understanding is the quality of soul, and the instruments of right notion are treated under the head of 'understanding' (*buddhi*). Kanada admits of only two such instruments, or *pramāṇas*, perception and inference. Comparison, revelation, and the other instruments of right notion, mentioned in other systems, the commentators endeavor to show are included in these two. Fallacies and other modes of inconclusive reasoning are further dealt with in connection with 'inference,' though with less detail than in the Nyaya, where these topics are favorite topics for discussion.

In point of time the Vaiśeshika system antedates that of the Vedanta (q.v.) and may be referred to some time not long before the Christian Era. The work of its reputed founder, Kanada, has been commented upon by a triple set of commentaries, and popularized in several elementary treatises. The text with the commentary of *Sankara Miśra* was edited at Calcutta in 1861 by Jayanarayana Tarka Panchanana, who added to it a gloss of his own; and some of the sutras were translated by Ballantyne (Mirzapore, 1851). Of later works on the same system may be mentioned the *Bhāshāparicchēda*, edited with the commentary called *Siddhāntamuktāvali*, and translated by Roer in the *Bibliotheca Indica* (Calcutta, 1850), and the popular *Tarkasañgraha* in several editions: also edited and translated by Ballantyne (2d ed., Calcutta, 1848), and edited again by Vidyasagara (ib., 1897); and by Vasadeo Athalya (Bombay, 1897). Consult: Gough, *The Vaiśeshika Aphorisms of Kánâda*, translated (Benares, 1873); Windisch, *Ueber das Nyāya-bhāshya* (Leipzig, 1886); Colebrook, *Miscellaneous Essays*, vol. i. (2d ed., London, 1873); Müller, *Six Systems of Indian Philosophy* (New York, 1899).

VAISHNAVAS, vĭsh′nȧ-vȧz (Skt. *vāiṣṇava*, adherent of Vishnu, from *Viṣṇu*, Vishnu, name of a Hindu god). The general name of all worshipers of Vishnu (q.v.), but applied particularly to those who worship Vishnu in his incarnate form, either as Krishna or as Rama. Even those who worship Vishnu under other forms, such as the reverers of 'Vishnu as the tortoise' (see VISHNU), are adherents at the same time of one of these two sects. Of the two, the older division comprises those who worship Vishnu as Krishna. These Krishnaites were known in the earliest sectarian period (c.200 B.C.) as *Pāñcarātras* and *Bhāgavatas*. Whether these names were at first applied to the same sectaries or to two divisions of Krishnaites is not known; but in the seventh century A.D. they appear to be two distinct bodies. The essential tenet of these sects is that which is maintained by all Vaishnavas, namely, that, besides the identity of Krishna with Vishnu, the human soul is a distinct entity, while incorporate in an earthly body, and after the death of the body it becomes one with Vishnu. This qualified idealism distinguished the Vaishnavas philosophically from the Saivas (q.v.) on the one hand, and from the Vedantists (see VĒDĀNTA) on the other. Another tenet held by all Vaishnavas, though not exclusively by them, is the doctrine of *bhakti* or saving faith, and this may be said to be the great popular support of all the Vaishnava sects. It appears first in the *Bhagavadgītā* (q.v.), the oldest scripture of the Vaishnavas. According to this doctrine, all works and other beliefs are without essential value, though good works and right knowledge are useful. The one essential, however, is faith in Krishna (or Rama) as Vishnu, i.e. as supreme deity. He who believes that Krishna is God is saved. Salvation, further, consists in being received back into God's essence. The corresponding activity on the part of the divinity is grace or favor extended to such as have faith. In the grosser conception of Vishnu as a god occupying a heaven of his own, the soul, instead of being reabsorbed, simply shares the joy of this heaven.

At the present time the Krishnaites are largely in the majority in Northern India, while the Ramaites are strongest in the southeast, the southwest being the home of one of the strong Krishnaite sects, which arose in the twelfth century. At this period, in fact, sprang up the chief sects of both parties, and from this time onward the antagonism between the sects and sub-sects of each separate division became powerful.

Before these popular schools or sects arose, a special division of Krishnaite Vaishnavas was formed (c.1200 A.D.) on the Malabar coast under the influence of Anandatertha, the founder of a school known as Madhvas. He taught not only the separate existence of human souls, but the separate existence of matter as an eternal essence. This school remains a restricted southern growth, but the 'duality doctrine,' as it is called, has been accepted by the masses over a wide area. Both the next great Krishnaite sects emphasize an entirely new practice, on which they lay more weight than they do on theology or metaphysics. This is the practice of revering the Child Krishna. No trace of this cult, with its accompaniment of madonna-worship, is to be found in the records of the older sects, and it is quite possible that the practice was an imitation of Christian usage. Unfortunately, with the introduction of this child-worship was still retained the antique conception of Krishna as an amorous shepherd, and under the influence of these two images, together with the continual emphasis upon *bhakti*, the worship of Krishna-Vishnu rapidly deteriorated. This element became supreme in the later development of the Krishnaite sects of the north, where among the lower classes it has superseded all other religious notions and has deeply affected even the cultivated classes.

The first of these sects is that of Caitanya, who was born in Bengal in 1485. His special religious tenet was 'love for Krishna.' This was expressed by songs and dances of an amorous and licentious character. Caitanya himself, like most of the late Vaishnava teachers, was regarded as also divine and as a reincarnation of Krishna himself. The second great sect of Krishnaites arose in the northwest and was founded by Vallabha, called also Vallabhacarya. His sect, if somewhat less licentious than that of Caitanya, was no less self-indulgent. The worship of the Child Krishna was particularly affected by the Vallabhas with all its excesses. But the sect is saved from the uniform low level of the Caitanyas through the fact that it is not without sectarian literature. The founder reverted to the non-dualistic doctrine of the Vedanta, and the philosophy of his school is thus distinguished from that of Caitanya, who taught that each believer was to exist as a separate spirit in a heaven filled with sensual pleasures. Both these sects elevate Radha, the mistress of Krishna, to a divine position. A reform of both these religious bodies took place in the eighteenth century. The Caran Dasis were protestants against the excesses of the Vallabha sect and they instituted a moral reform based on the purer belief and practice of the southern Madhva Krishnaites. A similar protest against the Vallabha sect resulted in the formation of a new division under the leadership of Narayana, who was worshiped as a god by his adherents. Other reforming sects of this sort scarcely deserve to be called Vaishnavas, as they are eclectic deists.

At the same time that Madhva was founding his Krishnaite sect in Southwestern India, Ramanuja in the southeast (about Madras) was founding the first distinctively Ramaite Vaishnava sect. The Ramanuja sect remained in the south, but the sect founded by Ramanuja's follower, Ramanand, was operative in the north in the fourteenth century, and to this sect are due in succession some of the reform movements of more recent times. The Northern School (Vadagalis) hold to the 'monkey doctrine,' while the Southern School (Tengalais) affect the 'cat doctrine.' The former doctrine holds that God saves the sinner as a monkey does its young, by allowing the young to embrace it and be carried to safety. The cat doctrine is Calvinistic, affirming that God saves as does a cat, by picking up the kitten without concurrence or effort on the kitten's part. The Tengalais are the more numerous and have a theological literature written in Tamil.

But the great difference between Krishnaites and Ramaites is moral and intellectual. The Krishnaite Vaishnavas, with few exceptions, such as that of the high-caste Madhva sect, are as epicurean and licentious in practice as they are unphilosophical in intellect. What literature they possess is small, apart from erotic poetry. On the other hand, the Rama schools have elaborated complete theological systems, and, generally speaking, they are morally above reproach. Most Ramaites hold that the deity is not without qualities, and in logical conclusion they maintain that Rama as Vishnu has a heaven of pure delight in which the believer will lead a pure but joyful existence, not being absorbed into the divine essence. In consequence of the moral tone of the Rama Vaishnavas, it is from them rather than from the Krishnaites that the later reformers draw their inspiration. Such reformers were in no sense themselves Vaishnavas, but rather deists and unitarians who are unsectarian. Kabir, one of the disciples of Ramanand, founded the sect of the Kabir Panthis, which still has a large following in Northern India, but unites Rama and the divine monkey, Hanuman (q.v.), in one common worship. A purely deistic sect also claiming Ramanand as the teacher of their founder is that of the Dadu Panthis. The literature of the modern Vaishnava sects is best represented by the *Ramcaritmanas* of Tulasidasa, the greatest of modern Hindu poets, and by the *Premsâgar* or 'ocean of love,' an erotic-religious poem of the Vallabha sect. For the older literature, see the article VISHNU.

It remains only to be said of the Vaishnavas that some of the sub-sects worship almost exclusively the 'female side of Vishnu,' in the form of his wife, Lakshmi, or in that of Sita, the wife of Rama. The Vaishnavas have several famous festivals, the chief being that of the *Rath Yāha* in Bengal, in which an image of the god is carried in a procession, the *Janmaṣṭami* or birthday festival of the Child Krishna at Benares, and the *Rās Yāha* or dance festival, commemorating the dancing of Krishna with the Gopis, his mistresses. The general sign of all Vaishnavas consists of two perpendicular marks on the forehead. They revere as symbols the Tulasi-plant and the salagrama stone, a white pebble; the veneration for this latter as a symbol, however, is of recent origin. Consult: Wilson, *Sketch of the Religious Sects of Hindus* (edited by Rost, London, 1862); Williams, *Brahmanism and Hinduism, or Religious Thought and Life in India* (3d ed., ib., 1887); Barth, *Religions of India* (ib., 1881); Hopkins, *Religions of India* (Boston, 1895).

VAIŚYA, vī′shyȧ (Skt. *vāiśya*, from *viś*, people). The third or agricultural and business class in the constitution of the early community of India. See CASTE.

VALAAM, vȧ-läm′ (Finnish *Valamo*). A small island in the northern part of Lake Ladoga (q.v.) Northwestern Russia. It is very picturesque and surrounded by numerous islets. On its southern end is the famous Valaam Monastery of the Transfiguration, which attracts numerous pilgrims.

VALAIS, vȧ′lȧ′ (Ger. *Wallis*). A southern canton of Switzerland, bounded by the cantons of Bern and Vaud on the north, Uri, Ticino, and Italy on the east, Italy on the south, and France on the west (Map: Switzerland, B 2). Area, 2027 square miles. It consists of the valley of the Rhone and a number of lateral valleys along its tributaries, inclosed by the Bernese Alps on the north and the Valais Alps on the south. Valais abounds in glaciers which occupy about one-fifth of its area. The highest point is the Dufour Peak on Monte Rosa, over 15,000 feet. Valais contains many kinds of minerals, principally lead, gold, iron, anthracite, marble, and limestone. Most of these minerals are worked. The canton is chiefly pastoral, vineyards and orchards being found only in the deep valleys. The wines of Valais are well known. The chief manufactures of the canton are soap, glass, sugar, and dynamite. The Constitution of Valais provides for a legislative assembly (*Grand Conseil*) elected directly at the rate of one member for every 1000 inhabitants. The capital is Sion (q.v.). Population, in 1900, 114,158, almost entirely Roman Catholic. The French-speaking inhabitants, who form about two-thirds of the population, inhabit the western part of the canton and the German-speaking the eastern.

The valley of the Upper Rhone, the *Vallis Pœnina* of the Romans, was conquered by the Romans in B.C. 57, and later incorporated with Rhætia. On the dissolution of the Roman Empire the region was occupied by the Burgundians, whose rule was supplanted by that of the Franks. After the disruption of the Frankish realm, at the close of the ninth century, it formed part of the Kingdom of Transjurane Burgundy and then of the Kingdom of Arles. Later the bishops of Sion and the counts of Savoy held sway in Western or Lower Valais, contending with each other for dominion, while Upper Valais was colonized by Germans, who founded a number of independent communities or 'tithings.' Finally, in the fifteenth century, Upper Valais, after joining the Swiss Confederation, secured control of Lower Valais, which was ruled as a subject territory. In 1798 the whole region became part of the Helvetic Republic. In 1802 Valais was made an independent republic by Napoleon, who annexed it in 1810 to France as the Department of Simplon. It was freed in 1814, and in 1815 was constituted a canton of the Swiss Confederation. It took part in the League of Sarnen as well as in the Sonderbund.

VALCKENAER, väl′ke-när, LODEWIJK KASPAR (1715-85). An eminent Dutch classical scholar, born at Leeuwarden, and educated at Franeker and Leyden. In 1741 he became professor of Greek at Franeker, and twenty-five years later was called to Leyden. He is known for his editions of Euripides's *Phœnissæ* (4th ed., 2 vols., 1824) and his *Hippo-*

lytus of Euripides, which contained the famous *Diatribe in Euripidis Perditarum Fabularum Fragmenta* (1768). He also edited Homer's *Iliad* with Scholia (1747), Theocritus, Bion, and Moschus (1781). His greatest work, however, was his *Diatribe de Aristobulo*, first published posthumously by Luzac (1806), in which he exposed the literary forgeries of the Alexandrians. His *Opuscula Critica*, etc., were published in 2 vols. (1801). Consult: Bergmann, *Memoria Valckenarii* (Utrecht, 1874); L. Müller, *Geschichte der klassischen Philologie in den Niederlanden* (Leipzig, 1869).

VALDAI (vȧl-dī′) **HILLS.** A low plateau or group of hills in West Central Russia, occupying the southwestern parts of the governments of Novgorod and Tver, and extending for about 250 miles midway between Saint Petersburg and Moscow (Map: Russia, D 3). They form the culminating portion of the broad elevation running through Central Russia, and rise very gradually from the surrounding plain. The interior, however, is cut into steep hills and valleys, the latter containing a number of lakes. The hills rise to the maximum height of a little over 1000 feet above the sea. They were formerly forested, but are now mostly cleared and cultivated. The plateau is the watershed between the Volga and the Dnieper, and of streams running into the Baltic Sea.

VAL-DE-GRÂCE, vȧl′de-grȧs′. A former Benedictine nunnery in Paris, founded by Anne of Austria, and changed into a military prison in 1790. The dome of the church, dating from 1645, is modeled on that of Saint Peter's at Rome. The church was the place of burial of the French royal family and the Orleans princes, and contains the tomb of Henrietta, wife of Charles I. of England.

VAL DEL BOVE, väl dĕl bō′vȧ. A crater of the volcano of Etna (q.v.).

VALDEPEÑAS, väl′dȧ-pȧn′yȧs. A town of the Province of Ciudad Real, Spain, 115 miles south of Madrid, on the right bank of the Jabalón River (Map: Spain, D 3). It is on the highway to Andalusia. It has manufactures of spirits, flour, and cooperage ware; but its reputation rests mainly upon its celebrated red wine. There are chalybeate springs in the vicinity. Valdepeñas, in 1900, had a municipal population of 20,688. The town made an heroic defense against the French in 1808.

VALDÉS, vȧl-dās′, Armando Palacio. A Spanish novelist. See Palacio Valdés.

VALDÉS, Juan de (c.1500-c.41). A Spanish-Italian theologian and reformer. He was born at Cuenca, in Castile, imbibed some of the ideas of the Reformation in Germany, and in 1528 wrote a treatise, *Diálogo de Mercurio y Carón*, criticising the Church in such manner that the Inquisition made Spain uncomfortable for him. He went to Naples in 1530, spent some time in Rome and Bologna, and in 1533 returned to Naples, where he resided until his death. He devoted himself to study and literature and gathered round him a choice circle, including Peter Martyr and Vittoria Colonna. He was an advocate of the Lutheran doctrines, but remained a Catholic.

Consult: Wiffen, *Life and Writings of Juan de Valdés, with a translation from the Italian of his Hundred and Ten Considerations*, by John T. Betts (London, 1865).

VALDEZ, Pierre. See Waldenses.

VALDIVIA, vȧl-dē′vē-ȧ. A southern province of Chile, bounded by Llanquihue on the south, Cautín on the north, Argentina on the east, and the Pacific on the west (Map: Chile, C 11). Area, 8315 square miles. The larger part of the surface is level and only the portion adjoining the Andes and the coast land are mountainous. The climate is moist and healthful and the soil is fertile. Forests are abundant in the mountainous regions, and timber is one of the most important products of the province. The chief occupations are agriculture and grazing. Population, in 1895, 60,687. A large proportion of the population is German. Capital, Valdivia.

VALDIVIA, Pedro de (1497-1554). The Spanish conqueror of Chile. He was born at Serena, in Estremadura, and served in the Spanish armies in the Italian wars, being present at the capture of Milan and the battle of Pavia (1525). He went to the New World and in Mexico joined Cortés, by whom he was sent to Peru when Pizarro asked for help against the Inca insurrection in 1535. His brilliant conduct in the battle of Salinas led to his selection to prosecute the conquest of Chile. In March, 1540, he started south with a hundred and fifty men. On February 7, 1541, he laid the foundations of the city of Santiago, and for six years he successfully combined the establishment of settlements in the country with the operations against the Indian armies. In December, 1547, he returned to Peru, where he rendered important service on the royal side in the contest with Gonzalo Pizarro. As soon as this rebellion was ended on the plain of Sacsahuana, Valdivia hastened back to Chile, in January, 1549, to renew the war against the Araucanian Indians. He met with repeated successes, but was unable to stamp out the guerrilla bands, which united in a fierce attack on the Spanish fort at Tucapel in December, 1553. Valdivia hastened to its relief, and had all but dispersed the Araucanians, when the latter were suddenly rallied by a young native page of Valdivia, named Lautaro, who deserted his master at the critical moment, called upon his countrymen to renew their attack, and annihilated the Spaniards (January 1, 1554). Valdivia was captured and killed, despite the efforts of Lautaro to save his life.

VALDOS′TA. The county-seat of Lowndes County, Ga., 156 miles southwest of Savannah, on the Plant System and the Georgia Southern and Florida railroads, and the terminus of the Valdosta Southern Railroad (Map: Georgia, C 5). It is the shipping centre of a region engaged in cotton and fruit growing and farming, and manufactures cloth and lumber products. The government, under the revised charter of 1900, is vested in a mayor, elected biennially, and a unicameral council. The water-works are owned and operated by the municipality. Valdosta was settled in 1859, and was incorporated in 1860. Population, in 1890, 2854; in 1900, 5613.

VALENCE, vȧ′läɴs′. The capital of the Department of Drôme, France, 66 miles by rail south of Lyons, crowning a hill on the left bank of the Rhone, below the confluence of the Isère (Map: France, L 7). The Cathedral of Saint Appolinaire, in the odd Auvergnat-Romanesque style, consecrated in 1095, contains an apse with colonnade. The Maison des Têtes (sixteenth century), with its beautifully decorated windows and its front sculptured with heads of Homer, Aristotle, Pythagoras, and Hippocrates, and the fine paintings of the Church of Saint Jean Baptiste are worthy of mention. There is a fine suspension bridge over the Rhone. Across the river lie the interesting ruins of the Crussol, a twelfth-century castle. The printing of linen and cotton fabrics, the manufacture of flour and tinned foods, and agriculture are important industries. The vineyards are of great extent. Population, in 1891, 19,970; in 1901, 26,946. Valence is the Valencia of the Romans.

VALEN′CIA, *Span. pron.* vȧ-lân′thē-ȧ. The name of a former kingdom of Spain, comprising the present provinces of Valencia, Alicante, and Castellón de la Plana. The region is bounded on the north by Aragon and Catalonia, on the east by the Mediterranean, on the south by Murcia, and on the west by Murcia, New Castile, and Aragon. Area, 8830 square miles. The surface is of a broken mountainous character, with some small plains scattered along the coast and in the uplands of the southwest. The plains bordering the Mediterranean abound in lagoons, from many of which salt is derived in large quantities. There are few good harbors. The most important rivers are the Segura, Guadalaviar, Júcar, and Mijares. The rainfall varies greatly, and the cold north winds and the hot southwest winds are very dry. The temperature varies from the extreme summer heat of the lower coast plains and valleys to the extreme winter cold of the inland mountain regions. With this variation in temperature and rainfall there is a wide variety of agricultural products. Wheat and other cereals are grown in fairly large quantities, but their yield is surpassed by that of the vine, rice, sugar, and fruits, among which the exports of oranges and figs have the lead. The stock-raising interests of the section are important. The mining industry is not very large, lignite, iron, lead, and zinc being produced in small quantities. In manufactures Valencia ranks next to Catalonia and has extensive textile establishments, iron and copper foundries, distilleries, sugar mills, and potteries. The fisheries and the curing of salt fish also employ a considerable portion of the population. The inhabitants, who preserve many traits of the Moorish admixture, in 1900 numbered 1,587,533. Upon the dissolution of the Caliphate of Cordova in the early part of the eleventh century, Valencia became an independent kingdom. Toward the close of the century it passed under the rule of the Almoravides, who were supplanted half a century later by the Almohades. In 1238 the city of Valencia was taken by James I. of Aragon, who soon became master of the region.

VALENCIA. A Mediterranean seaport of Spain, capital of the Province of Valencia, 185 miles east-southeast of Madrid, on the right bank of the Guadalaviar, two and a half miles from its mouth (Map: Spain, E 3). As the former capital of the Kingdom of Valencia it retains many traces of Moorish occupancy. The surrounding *huerta* resembles a vast shady orchard and bears magnificent groves of citron, orange, and mulberry. The city itself is picturesque in the crowded, narrow, and winding streets of the older portion and charming in the broader streets and luxuriant *plazas* and *paseos* of the newer part. Its climate is mild and very dry. The public buildings are numerous and interesting architecturally and because of their historical significance. Among the important churches the Cathedral La Seo occupies first place. This structure was begun in 1262 and completed in 1482. The Church of San Andrés contains some beautiful frescoes and paintings of Juanes, Ribalta, and Vergara. The former Convento del Cármen is now utilized for the Provincial Museum of Paintings, with a very complete collection representing the Valencian school and some notable foreign works. La Lonja (the silk exchange), the centre of the commercial life of the city, is a beautiful Gothic structure, built on the site of the Moorish Alcázar. The Aduana, a superb structure erected for a custom house by Charles IV., is now occupied as a tobacco factory, employing 4000 operatives. The provincial hospital, housed in a fifteenth-century structure, accommodates 6000 patients annually. The ornamental Plaza de Toros, or bull ring, reputed the best in Spain, seats 17,000 spectators. The Plaza del Mercado is the largest of the public squares of the city; others of note are the Plaza del Príncipe Alfonso, the Plaza de Tetuán, the site of the old Citadel, and the Plaza de la Reina, a busy shopping and café centre. Modern improvements include the introduction of tramways, of gas and electricity, an adequate water supply, and a sewerage system. The harbor of Valencia is one of the most secure on the Mediterranean coast. The chief exports are rice, melons, oranges, and other fruits, green and dried, wines, silks, raw and spun, and an excellent quality of olive oil. In 1898 more than 1200 vessels entered and cleared. The industries of the city include tobacco manufacturing, silk spinning, and hemp and linen weaving. There are also manufactures of velvet, hat plush, felt, gloves, fans (a special product), iron and bronze ware, leather goods, and pottery ware, especially the mosaic bricks known as azulejos, for which there are more than twenty establishments in the environs of the city. The agricultural industries of the vicinity are also important. Valencia is the seat of one of the foremost universities of Spain. (See VALENCIA, UNIVERSITY OF.) The population, illustrating in character and physical traits the early Moorish admixture, numbered, in 1900, 215,687. Valencia first appears in history in B.C. 138, when it was given the *Jus Latinum.* It was destroyed by Pompey, captured by the Visigoths in 413, and by the Moors in 714. In 1021 it became the capital of an independent Moorish kingdom. In 1095 it was captured by the Cid, but the Moors subsequently assumed control, until its final capture by James I. of Aragon in 1238. The expulsion of the Moriscoes at the beginning of the seventeenth century greatly crippled its prosperity, and by espousing the Austrian side during the War of Spanish Succession, it lost many of its ancient privileges. In 1812 it was captured by Suchet and remained in the possession of the French until the following year.

VALENCIA. The capital of the State of Carabobo, Venezuela, situated 24 miles south of Puerto Cabello, with which it has railway connection, near the western end of Lake Valencia or Tacarigua (Map: Venezuela, D 2). Valencia is the second city of the Republic, and is well constructed with broad streets, well-kept plazas, a beautiful market and alameda. Valencia contains a notable cathedral erected during the first half of the nineteenth century. The city is on the banks of the Aragua River. The chief exports are coffee, sugar, cacao, and hides. Population, in 1894, 38,654. Valencia was founded in 1555. During the struggle for independence it was the scene of battles fought by Bolivar in 1814 and 1821, the latter of which gained the freedom of Venezuela from Spain. On account of the various sieges from 1810 to 1821 and the great earthquake of 1812, there are many ruins in the vicinity.

VALENCIA, UNIVERSITY OF. A Spanish university, founded by the union of an episcopal foundation for theology and a municipal school of arts, medicine, and civil and canon law, both dating from the middle of the fourteenth century. These were combined about 1500. Several colleges were founded in the sixteenth century, the period of the greatest prosperity of the institution. From that century it sank in numbers and reputation. It was reorganized in the decade 1848-58, and has since grown to be one of the leading universities in the kingdom. It has the three faculties of law, physics-chemistry, and medicine, and in 1901 had 1728 students.

VALENCIENNES, vå'läɴ'syĕn'. The capital of an arrondissement in the Department of Nord, France, and a fortress of the second class, at the junction of the Rhondelle and the Scheldt, 30 miles by rail southeast of Lille (Map: France, K 1). Broad boulevards are laid out on the site of the old fortifications, which were demolished in 1892. There are many houses of the seventeenth century, which give the streets a mediæval apearance. The handsome Hôtel de Ville, pure seventeenth century except the façade, contains a large collection of paintings, especially of the Flemish school (including splendid specimens of Rubens), and a collection of sculptures. The Gothic Church of Saint Géry, dating from the thirteenth century, with a modern tower, and the Church of Notre Dame du Saint Cordon, a modern structure in thirteenth-century style, with beautiful stained-glass windows by Lévêque, are worthy of notice. In the old Jesuit College is the municipal library of more than 25,000 volumes, containing much valuable Romance literature. There are an academy for sculpture and painting, a museum of natural history, an immense hospital, a lycée, and an arsenal. The famous Valenciennes lace is no longer manufactured. The extensive coal-fields amid which Valenciennes lies have made it a metallurgical centre. Glass, sugar (from beets), chemicals, cambrics, and lawns are also manufactured. Chicory coffee is shipped in large quantities. Population, in 1901, 30,946. Valenciennes is the Roman Valentiana. It came to France by the Treaty of Nimeguen in 1678.

VALENCIENNES, ACHILLE (1794-1865). A French zoölogist, born in Paris and educated there. In 1836 he became professor of ichthyology at the Museum of Natural History. He shared in Cuvier's *Histoire naturelle des poissons*, which he continued (22 vols., 1829-49). Valenciennes wrote *Histoire naturelle des mollusques, des annélides et des zoophytes* (1833).

VALENCY (Lat. *valentia*, strength, from *valere*, to be strong, able; connected with OIr. *flaith*, power, Lith. *galeti*, to be able, Goth. *waldan*, OHG. *waltan*, Ger. *walten*, AS. *wealdan*, Eng. *wield*), VALENCE, or ATOMICITY. In chemistry, the combining capacity of an atom, with reference to the number of other atoms with which it can be directly combined. The conception of valency is an offspring of the atomic and molecular theories. These theories led to a knowledge of the numbers of different atoms making up the molecules of compounds; but as in many cases very different compounds were found to have the same composition and the same molecular weight, it became clear that differences in the chemical and physical properties of compounds must often be caused by differences in the manner of combination of their atoms. Those differences of combination had to be investigated, and thus arose the question, In what manner does affinity act in holding together the atoms of compounds? In considering various compounds with a view to obtaining some light on this question, chemists were gradually led to a series of assumptions, the incorporation of which in atomic chemistry has proved exceedingly fruitful.

First of all it was observed that, in compounds of hydrogen with some one other element, one atom of hydrogen can hold in combination only one atom of the other element; this was shown by such compounds as hydrochloric acid (HCl), hydrobromic acid (HBr), hydriodic acid (HI), etc., and the fact was expressed by saying that hydrogen is *univalent* or *monad*. The valencies of certain other elements were then found by considering their compounds with hydrogen, on the principle that by every unit of their combining capacities the atoms of those elements can hold one atom of hydrogen; for hydrogen itself is univalent, i.e. has unit combining capacity. From the compounds already mentioned it may be seen that the atoms of chlorine, bromine, and iodine are, like hydrogen, univalent; for each atom of these elements can be combined with only one atom of hydrogen. Similarly, compounds like water (H_2O), sulphureted hydrogen (SH_2), ammonia (NH_3), and marsh-gas (CH_4) show that oxygen and sulphur are di-valent, that nitrogen is tri-valent, and that carbon is quadri-valent. The valencies peculiar to some of the elements being thus established by an inspection of their compounds with hydrogen, the valencies of the other elements can be found by studying their compounds not necessarily with hydrogen, but with any element of known valency. Thus compounds like sodium chloride ($Na\,Cl$), postassium chloride (KCl), etc., show that the atoms of sodium and potassium are univalent; for they can hold in combination only one atom of another univalent element. The same thing is shown by the fact that sodium or potassium takes the place of one atom of hydrogen in acids; for example, in hydrochloric acid:

$$Na + H\,Cl = Na\,Cl + H$$
$$K + H\,Cl = K\,Cl + H$$

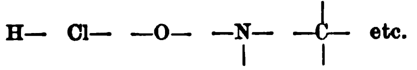
Evidently, an atom of sodium or potassium is *equivalent* to an atom of hydrogen, and as the latter is univalent, the former, too, must be univalent. Similarly, an atom of calcium takes the place of two atoms of hydrogen:

$$Ca + \begin{matrix} HCl \\ HCl \end{matrix} = CaCl_2 + 2H$$

and therefore the element calcium, or rather an atom of this element, is considered di-valent.

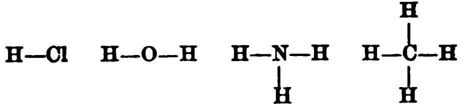
Thus a few simple compounds and a few simple reactions led to a knowledge of the valencies peculiar to all of the elements. The conception of valency has proved especially useful in the domain of organic chemistry, i.e. the chemistry of the compounds of carbon. Our modern 'structural theory' is based entirely on the assumption that an atom of carbon is invariably quadrivalent; and the usefulness of the structural theory can hardly be overestimated. For it exhibits in a clear and simple manner the relations between similar as well as different compounds, and, above all, it permits of determining the exact number of different compounds that may have the same composition and the same molecular weight, and thus permits of foretelling the existence of compounds before they have been actually obtained.

Graphically each unit of combining capacity of an atom is represented by a dash added to its symbol. The valencies of different elements are thus denoted as follows:



$$H\!-\quad Cl\!-\quad -O-\quad \underset{|}{-N-}\quad \overset{|}{\underset{|}{-C-}}\quad \text{etc.}$$

When two atoms combine, at least one valency of each is employed, and in compounds like the following, the atoms are said to be linked together by single 'bonds,' each 'bond' evidently representing two 'valencies' or 'affinities' (i.e. one unit combining capacity of each of the combining atoms):



$$H\!-\!Cl \qquad H\!-\!O\!-\!H \qquad H\!-\!\underset{\displaystyle H}{\underset{|}{N}}\!-\!H \qquad H\!-\!\overset{\displaystyle H}{\overset{|}{\underset{\displaystyle H}{\underset{|}{C}}}}\!-\!H$$

Hydrochloric acid **Water** **Ammonia** **Marsh-gas**

The graphic representation of valency suggests an important question, viz.: Are the valencies of an atom forces acting only in certain directions, or do they act, like gravity, in all directions? A further question naturally suggests itself in the case of atoms having more than unit valency, viz.: Are the several affinities equal to one another in power? To answer these questions is a matter not of idle speculation, but of necessity in the case—again—of the compounds of carbon. The study of these compounds has led chemists to make the following assumptions: (1) the four valencies of carbon are in all respects equal; (2) they act in four different directions, which are perfectly symmetrical with respect to the carbon atom. The carbon atom is, namely, imagined to be placed at the centre of a regular tetrahedron, and four equal forces are assumed to act in the directions of the four vertices of the tetrahedron. A further assumption that thrusts itself upon the organic chemist is that in every compound capable of independent existence all the valencies of the constituent atoms are satisfied by combination, and that no valency is 'free.' Without these assumptions organic chemistry can make no progress. These assumptions made, there is hardly a general fact that remains unaccounted for. The assumptions, though hypothetical in character, are therefore incorporated as principles of science, and thus in connection with the compounds of carbon chemistry answers in a sense the question stated at the beginning of this article, viz.: In what manner does affinity act in holding together the atoms of compounds?

In the case of other elements than carbon, the application of the idea of valency has been much less useful and much less successful. In fact, the obstacles in the way of consistently applying the idea to the several elements are so great that the idea would probably have been abandoned long ago, were it not for its great usefulness in the case of carbon. The chief obstacles are as follows: Firstly, the valencies of most elements are found to be variable and hence unreliable as a basis for predicting the constitution of unknown substances. Thus, while in ammonia (NH_3) the atom of nitrogen is tri-valent (because combined with three univalent atoms of hydrogen), in nitric oxide (NO) it is di-valent (because combined with one di-valent atom of oxygen), and in ammonium chloride (NH_4Cl) it is penta-valent (because combined with five univalent atoms, viz. four hydrogens and one chlorine). In other compounds nitrogen seems to have still other valencies. Turning to iron, we find it di-valent in ferrous chloride ($FeCl_2$) and tri-valent in ferric chloride ($FeCl_3$). Chlorine is univalent when combined with hydrogen, and quinqui-valent when combined with oxygen. Sulphur is di-valent when combined with hydrogen, and hexa-valent when combined with oxygen. Phosphorus is tri-valent when combined with hydrogen, and quinqui-valent when combined with oxygen. Oxygen is di-valent in nearly all of its compounds; yet in di-methyl ether hydrochloride oxygen must be assumed to be quadri-valent. Even in the case of carbon an exception is known: in ordinary carbonic oxide (CO) the carbon atom is apparently di-valent (because combined with one di-valent atom of oxygen)—unless we assume that the oxygen atom in this compound is quadri-valent, and hence that the compound is an exception to the rule according to which oxygen is di-valent. Further, it has been stated above that the atoms of hydrogen, chlorine, iodine, and sodium were primarily assumed to be uni-valent. One might therefore expect that in all combinations of any two or three elements one atom of one would combine with one, and only one atom of the other. Yet the compound called tri-chloride of iodine has the formula ICl_3. Is iodine tri-valent in this compound? Another compound, a hydride of sodium, has the formula HNa_2. Is hydrogen in this compound di-valent? And is, therefore, the valency even of hydrogen variable? Again when we find the molecule of hydrogen gas to be made up of two hydrogen atoms, we conclude that the affinity of each of these atoms is satisfied by that of the other atom. But the molecules of certain uni-valent elements (the vapors of sodium, potassium, iodine, at high temperatures, etc.) are known to be made up each of a single atom. Are the affinities of these single atoms 'free?' Or shall we accept the verdict of organic chemistry, according to which the molecule of a substance capable of independent existence can contain no 'free' affinities? But then how can a single atom form a molecule? While we thus search in vain for an explanation as to what becomes of affinities in certain compounds, we find that other compounds seem to involve the use of more valencies than those possessed by the constituent atoms. Examples of such compounds are presented by crystallo-hydrates, like $NaCl.2H_2O$, made up of several molecules within each of which all the available valencies should be expected to be satisfied. Other examples of this kind are presented by many of the minerals found in nature. Do atoms, then, possess additional valencies which sometimes do and sometimes do not come into play?

All of these questions remain, as yet, unanswered. And hence while the conception of valency serves as an excellent working principle for the correlation of the compounds of carbon, many important facts remain for the present beyond its reach. See CHEMISTRY; CARBON COMPOUNDS; STEREO-CHEMISTRY.

VA′LENS (c.328-378 A.D.). Roman Emperor of the East (A.D. 364-378). He was the brother of Valentinian I. (q.v.), was born near Cibalis, in Pannonia, about A.D. 328, and was associated with his brother in the Imperial authority, receiving as his share of the Roman world Asia, Egypt, and Thrace, in 364. His sovereignty was, however, disputed by Procopius, a supposed scion of the race of Constantine, who raised his standard in Thrace, was crowned at Constantinople, and for two years maintained his ground with skill and courage, till the defeat of his troops at Thyatira and Nacosia, followed by his capture and death in 366. The first prominent act of Valens's reign was a reduction of 25 per cent. in the taxes. The prolonged imprisonment of 3000 Ostrogoths, who had been sent to aid Procopius, led to a war which lasted from 367 to 369. The contest was carried on in the country of the Goths and was throughout in favor of the Romans. Difficulties arose immediately afterwards (370) with the Persians, who sought to occupy Armenia, although war was not declared till the end of 372, when the Romans were victorious. Valens, who had removed to Antioch at the beginning of the war, now occupied himself with the religious quarrels between the Arians and the orthodox party, which at that time raged with much violence over the whole Eastern Empire. Affairs on the eastern frontier again assumed a threatening aspect; but the Romans were disinclined any longer to interfere with the designs of the Persians on Armenia, and concluded a somewhat discreditable treaty in 376. In the meantime the Goths, who had for some time been peacefully settled in Dacia, were assailed by the advancing hordes of the Huns. The Ostrogoths, who first felt the shock, were partly incorporated, and the remainder forced to retreat; the Visigoths next attempted to stem the torrent, but without success, and crowds of fugitives crowded to the north bank of the Danube. Valens accorded permission to a large body of Goths under Fritigern to cross into Mœsia and Thrace, and take possession of the waste lands in these provinces; the fugitive Ostrogoths soon afterwards crossed the river without permission; and the alarm which the numbers and turbulence of his new subjects speedily aroused led Valens to the adoption of such impolitic measures that the gratitude of the Goths for shelter afforded was turned to bitter resentment. Valens at last resolved on war, and engaged the Goths near Adrianople, August 9, 378. His army was totally routed, and two-thirds of it, including Valens himself and most of his chief officers, left dead on the field.

VALENTIA, vȧ-lĕn′shĭ-ȧ, or **VALENCIA.** A small island off the southwestern coast of Ireland noted as the eastern terminus of the submarine cables between Great Britain and America (Map: Ireland, A 5).

VALENTIA. One of the five provinces into which Britain was divided under Diocletian, covering the portion of Scotland south of the wall of Antoninus.

VAL′ENTINE. A little-known saint and martyr of the third century, whose day is kept on February 14th. He is said to have cured the blind daughter of a certain Asterius who had been charged by the Emperor Claudius to win him back to paganism, but who was thus converted to Christianity. Valentine was accordingly imprisoned, tortured, and finally beheaded. It is impossible to trace any connection between his story and the celebration afterwards connected with his day. It has been suggested that this may be a survival, with a Christian sanction, of the ancient Roman festival of the Lupercalia, celebrated in the month of February, at which it was customary to put the names of young women into a box, from which they were drawn by the men as chance directed. A custom exactly similar to this was common in England and France for centuries, and for a time very popular among the upper classes, and at many European courts. From Pepys's *Diary* we learn that in the reign of Charles II. married as well as unmarried persons could be chosen. At one time it was customary for both sexes to make presents to each other, but afterwards the obligation was restricted to young men, who were supposed to remain faithful for the entire year to the service of their 'Valentines.'

VALENTINE. (1) A character in Shakespeare's *Two Gentlemen of Verona*, one of the two whose humorous adventures give the play its title. (2) The extravagant and ingenious hero of Congreve's *Love for Love*, a rôle which the actor Betterton has made famous. (3) The extravagant hero of Beaumont and Fletcher's *Wit Without Money*. (4) The brother of Gretchen in Goethe's *Faust*. He is killed by the title character while trying to avenge the family honor.

VALENTINE. A sentimental romance by George Sand (1832), deriving its name from that of the leading female character, a misunderstood wife. The story represents some phases of the author's own experience.

VALENTINE, BASIL. A pseudonym under which Johann Thölde published in 1644 a work entitled *Halographia*. *Basil Valentine* was an alchemist who lived in Germany in the fifteenth century. See VALENTINUS, BASILIUS.

VALENTINE AND OR'SON. A Carolingian romance, written in the second half of the fifteenth century and printed at Lyons in 1495. It narrates the history of the two title characters, who are twin brothers, sons of the Emperor of Constantinople. They are born in a wood. Orson is carried off by a bear and grows up as a savage denizen of the forest, but Valentine is found by his uncle, King Pepin, and is trained at the palace to be a finished courtier. In 1589 Hathaway and Munday wrote a play founded upon the story, and six years later an interlude bearing the same title was produced.

VALENTINE VOX, THE VENTRILOQUIST. A lengthy and once popular novel by Henry Cockton (1840), abounding in farcical situations produced by the hero's use of his gift. It is said to have influenced a change in the English lunacy laws through its description of a sane man driven to madness by incarceration in a lunatic asylum.

VALENTINIAN. A highly rhetorical romantic drama by Fletcher produced before March, 1618-19, but not printed until 1647. It contains some quite simple and very beautiful songs.

VAL'ENTIN'IAN (VALENTINIANUS). The name of three Roman emperors of the same family. The most famous, VALENTINIAN I. (A.D. 364-375), was the son of humble parents, and was born at Cibalis, in Pannonia, in 321. Valentinian entered the army at an early age, and rose rapidly in rank under the emperors Constantius and Julian, only, however, to fall more rapidly; for he was degraded by Constantius in 357, and banished by Julian in 362. Restored to favor in the following year, he distinguished himself in the East, and on the death of Jovian was unanimously chosen as his successor (February 25, 364). A month after his accession he chose as his colleague his brother, Valens (q.v.), to whom he resigned the government of the East, reserving for himself Illyricum, Italy, the Gauls, Britain, Spain, and Africa. During Valentinian's reign the Alemanni repeatedly (366-368) ravaged the east, and the Saxons (370) the northeast of Gaul; Illyricum was wasted (370) by the Quadi, and Africa by the southern desert tribes, though these invasions were mostly repelled and revenged. The internal administration, on the other hand, was excellent, for the Emperor added to his ability prudence and firmness, vigilance and impartiality. Though himself a zealous Catholic, he permitted his subjects to adopt whatever religion they chose, and strictly forbade all persecution or annoyance on account of religious belief. On account of the abuse of ecclesiastical influence, he excluded priests and monks from the right of succession to property; judicial proceedings were forbidden to be held in private; the extreme license of speech hitherto allowed to advocates was restrained; gratuitous medical attendance was provided for the poor of Rome; and schools were established throughout the Empire. The success of his administration was doubtless much owing to his fortunate choice of officers: Theodosius the Elder in Africa and Britain, Jovinus in Gaul, and Theodosius the Younger (afterwards Emperor) in Illyricum. In private life Valentinian was above reproach, but his violent temper ultimately caused his death, for while giving audience to the deputies of the Quadi, with whom he was then at war, he worked himself into such an excess of passion as to rupture a blood-vessel in his chest, and fell back dead into the arms of his guards (November 17, 375). By his first wife he had one son, Gratianus (q.v.); and by the second, Justina, another son, Valentinian, and three daughters, one of whom, Galla, became the wife of the Emperor Theodosius I.

VALENTINIAN II. (A.D. 375-392) the younger son of the preceding, was born A.D. 372, and received from his elder brother, Gratianus (q.v.), the provinces of Italy, Illyricum, and Africa, as his share of the Western Empire. During his long minority the Empress Justina administered the government; and about three years after her death Valentinian, who had given promise of good administrative qualities, was murdered at the instigation of the Frank Arbogastes, the commander-in-chief of his army (May 15, 392).

VALENTINIAN III. (A.D. 425-455), the grandnephew of the preceding, was born about A.D. 419 and was seated on the throne of the West by Theodosius II., Emperor of the East, in 425. Valentinian was a weak and contemptible prince and may be said never to have ruled during the thirty years that he sat on the Imperial throne; his mother, Placidia, governed till her death in 450, and she was succeeded by the eunuch Heraclius. The regulations enacted for the internal administration were creditable, and especially so when ecclesiastical interests were involved, but the utter corruption of manners, the complete extinction of 'public spirit,' the exactions of the tax collectors and commissioners, the employment of the powers of the executive in the avenging of private quarrels, and the impossibility of obtaining redress for injuries, showed that the Empire had fallen far beyond remedy. The early part of Valentinian's reign was disturbed by the contests between the 'comites' Boniface and Aëtius, the former of whom had supported, and the latter resisted Valentinian's claims to the throne; but notwithstanding this, Aëtius prevailed upon the Empress to declare his rival, the Governor of Africa, a public enemy; and the latter called to his aid the Vandals under Genseric (q.v.). Thus Africa was lost to the Empire. But Aëtius, notwithstanding, proved himself the bulwark of the Roman power in Europe; the Franks, Goths, Burgundians, and other German nations who had encroached on the Empire were successively defeated and repelled, and the advance of the Huns was stayed on the field of Châlons. Yet the labor of defending an extensive empire from attack on all sides was too much for one man; and much of Spain and Gaul was seized by the Suevi and Visigoths, the north of Italy was ravaged by the Huns, Sicily and Sardinia by the Vandals, and even Rome was repeatedly besieged, while Britain was abandoned to the Picts and Scots. Aëtius seems to have committed the same error as his predecessor Stilicho (q.v.) in attempting, by the marriage of his son to Valentinian's daughter, to transfer the Imperial dignity to his own family, and, like him also, he was assassinated, though by the sword of his master (454). In the following year Valentinian was conspired against by the friends of Petronius Maximus and the adherents of Aëtius, and murdered, March 16th.

VALENTINIANS. A Gnostic sect or school, founded by Valentinus, who went from Alexandria to Rome about A.D. 140 and died there, or in Cyprus, about 160. They recognized heathenism as a preparatory stage of Christianity, and divided the higher spiritual world into fifteen pairs of æons, each consisting of a male and a female. The first pair, or syzygy, is made up of Bythos, or God in himself, and Ennoia, or God as existing in his own thoughts; from these emanated next Nous (Intelligence) and Aletheia (Truth), and so on. As the last æon, Sophia (Wisdom), transgressed the bounds that had been laid down by the æon Horos, and a part of her being became lost in Chaos, there was formed a crude being, called Achamoth, which, through the Demiurgos that emanated from it, created the corporeal world. Horos now imparted to the souls of men (for all the bodies composing the corporeal world are possessed of souls) a pneumatic or spiritual element, but this only attained to full activity when Christ, a collective emanation from all the æons, appeared as Saviour, and united himself with the man Jesus. In the end, all that is pneumatic, and even the originally psychic or soul element in as far as it has assimilated itself to the psychic, will return into the Pleroma. The Valentinians existed as late as the second half of the fourth century. See GNOSTICISM.

VAL'ENTI'NUS (?-c.160). The founder of one of the Gnostic sects which came into existence in the first half of the second century. According to Epiphanius (*Hœr.* xxxi. 2) he was born in Egypt, as some assert, of Jewish parents, and was educated in the Hellenic schools of Alexandria. During the reign of Antoninus Pius (about 140) he came to Rome, where he first appeared as an orthodox religious teacher. On his settling in Cyprus he became an open enemy to the Church and began to propagate his peculiar doctrines, for which see GNOSTICISM; VALENTINIANS.

VALENTINUS, BASILIUS. A mediæval alchemist, born probably on the upper Rhine. In his youth he is said to have made extensive travels through Spain, the Low Countries, and England, and in 1413 he is found living in the monastery of Saint Peter at Erfurt. His numerous writings offer a curious mixture of mystical obscurity and real scientific love of investigation, especially in chemistry and metallurgy, in which he made some notable discoveries. It is not known whether his works were originally composed in German or in Latin; the most complete edition of them is that published by Petrāus (Hamburg, 1717).

VALERA Y ALCALÁ GALIANO, vȧ-lā'rȧ ē äl'kȧ-lä' gä'lē-ä'nō, JUAN (1824-1905). A Spanish novelist, poet and scholar, born at Cabra, in the Province of Cordova. He was educated at Malaga and at the University of Granada, where he took his degree in law, and then entered upon a diplomatic career (1847). When the Duke de Rivas was sent as Spanish Ambassador to Naples, Valera accompanied him. He was then a member of the Spanish legations at Lisbon (1850), Rio Janeiro (1851-53), Dresden and Saint Petersburg (1857-58). After his return to Madrid (1858) he became one of the editors of the liberal journal *El Contemporáneo* (1859). He was a leading member of the Union Liberal, and was made Minister to Frankfort (1865) by General O'Donnell. After the Revolution of 1868 he was appointed Director of Public Instruction. During the reign of Alfonso XII. he was Ambassador to Lisbon (1881-83), Washington (1885), and Brussels (1886), and in 1893-95 to Vienna. Throughout all his diplomatic and political activity he produced works which rank among the highest that his country's literature contains.

Valera really began the movement in fiction that was the glory of the last three decades of the nineteenth century in Spain with his *Pepita Jiménez*, first published as a serial in 1874 and since translated into many modern languages. *Pepita* was written after Valera had steeped his mind in the Spanish mysticism of the sixteenth and seventeenth centuries. His next novel, *Las ilusiones del doctor Faustino* (1875), the story of a modern Faust, did not catch the popular favor so quickly as *Pepita*. His third novel, *El comendador Mendoza* (1877), is free from philosophizing. After a shorter story, *Pasarse de listro*, appeared the *Doña Luz* (1879). Having abandoned politics, Valera wrote *El hechicero, Juanita la larga, La buena fama, Genio y figura, De varios colores*, and *Morsamor*, all attractive novels. The short tales of Valera are hardly less known and appreciated than his more extended works. Among them are the *Cuentos, dialogos y fantasias*, the delightful little *El pájaro verde*, the *Parsondes*, the *Asclepigenia*, the *Gopa*, and the *Bermejino prehistórico*. In the poetry of Valera his erudition is more visible than any other trait. By translating or paraphrasing in verse the poems of foreign authors, Valera has made his countrymen acquainted with portions of the poetic literature of Germany and the English-speaking regions; thus he has rendered into Spanish verse parts of Goethe's *Faust*, of Uhland's ballads, and of Moore's *Paradise and the Peri;* poems of James Russell Lowell, Whittier, and W. W. Story. He also translated Schack's *Poesie und Kunst der Araber* (1881). As a critic he displays great powers of observation, and gives evidence of wide reading.

Among his critical and other works are *Tentativas aramáticas* (1879); *Disertaciones y judicios literarios* (1882); *Arte de escribir novelas* (1887); *Estudios criticos* (2d ed. 1884); *Nuevos estudios críticos* (1888); *Cartas americanas* (1889); *De Rios argentinos* (1901); *Ecos argentinos* (1901); and *Florilegio de poesías castellanas del siglo XIX.* (1901-02). Consult Brunetière, *La casuistique dans le roman de Juan Valera*, in his series *Histoire et littérature*, vol. i. (Paris, 1884).

VALÈRE, vȧ'lâr'. A stock name for a lover in French classical comedy. In Molière's *L'avare* he is the son of Anseline and lover of Elise, Harpagon's daughter. The character occurs also in *Le dépit amoureux, L'école des maris*, and *Le médecin volant*, and in Mrs. Centlivre's *Gamester*.

VALERIAN (OF. *valeriane*, Fr. *valériane*, from ML. *valeriana*, valerian; probably from Lat. *Valerianus*, prop. name, from *valere*, to be strong, able), *Valeriana*. A genus consisting of about 180 species of annual and perennial herbs of the natural order Valerianaceæ. The common valerian (*Valeriana officinalis*) is abundant in ditches, moist woods, etc., throughout Europe and Northern Asia. Its fleshy root (*valerianæ rhizoma*) has been used in medicine as an antispasmodic and stimulant—actions attributed to valerianic acid.

The chief ingredients of valerian are woody fibre, resinous and gum-like matters, and a little more than one per cent. of a volatile oil, which is crystallizable, and in which *valerianic* or *valeric acid* is developed on exposure to the air. There are three official preparations, viz. the *fluid extract,* the *tincture,* and the *ammoniated tincture.*

The greater valerian (*Valeriana Phu*), which grows in alpine districts of the Continent of Europe, is now almost entirely disused, although it is said to be one of the strongest of the European valerians, a preëminence which *Valeriana Dioscoridis* disputes with it. *Valeriana celtica* and *Valeriana saliunca,* alpine species found in Styria and Carinthia, are exported to India to be used as substitutes for spikenard (q.v.) and for perfuming baths. *Valeriana sitchensis,* a native of the United States, is said to possess the medicinal properties. The root of *Valeriana edulis,* a species found in Northwestern America, is used as food by the Indians.

VALERIAN (PUBLIUS LICINIUS VALERIANUS). Roman Emperor A.D. 253-260. He was descended from an ancient and noble family, and was chosen for his integrity and accomplishments to the office of censor. Faithful in his allegiance to Gallus, he went to summon the legions of Gaul and Germany to aid the feeble Emperor against the usurper Æmilianus, but arrived too late to save his master. The usurper's troops murdered their own chief, and united with their late antagonists in proclaiming Valerian Emperor, August, A.D. 253. He was then about 60 years old, and took as colleague his eldest son, Gallienus (q.v.). Valerian showed abundant proof during his short reign of most ardent zeal for the prosperity of the Empire, but the times required a ruler of more energy and ability, as the irruption of the Franks into Gaul, despite the efforts of Aurelian, the devastation of Thrace, Macedonia, Greece, and the archipelago by the Goths, the advance of the Alemanni to Milan, and the conquest of Syria and Armenia by the Persian King Sapor (Shapur), testified. The troubles in the East appearing most threatening, Valerian went thither in person, and was for a time successful, but was surprised by superior numbers at Edessa, was defeated, and with the remnant of his army forced to surrender (A.D. 260). Valerian remained in captivity till his death. The statements regarding the indignities heaped upon the unfortunate captive by his haughty conqueror are probably false, or at least much exaggerated. After his death his skin was flayed off, stuffed, and preserved as a proud trophy of victory, which was invariably exhibited to the ambassadors from Rome to the Sassanid Court.

VALERIANOS, vȧ'lā-rê-ä'nọs, APOSTOLOS. The real name of the Greek navigator more commonly known as Juan de Fuca (q.v.).

VALERIC or **VALERIANIC ACID.** A volatile fatty acid represented by the formula $C_4H_9.CO_2H$. It is a limpid, colorless, oily fluid of a penetrating odor, similar to that of valerian root, and of an acrid taste. It makes a transparent spot on paper, but the spot disappears on exposure to the air. It is only slightly soluble in water, but dissolves in alcohol and ether in all proportions. It exists in and is obtained by distilling valerian root with water acidulated with sulphuric acid. It may be similarly obtained from angelica root, and some other vegetable sources. It is also formed during the oxidation of fats and fatty acids (especially oleic acid), either by nitric acid or mere exposure to the air, by the oxidation and putrefaction of albuminoids, etc., but the best method of preparing it is by distilling a mixture of amyl alcohol (or fusel oil) with bichromate of potash and sulphuric acid.

The following salts are used in medicine: (1) *Valerianate of ammonia,* which forms colorless, or white, flat quadrangular crystals that are deliquescent in the air. (2) *Valerianate of iron,* a dark-red amorphous powder which is readily soluble in alcohol, but is insoluble in cold water. (3) *Valerianate of zinc,* which forms brilliant white pearly tabular crystals, with a feeble odor of valerianic acid and a metallic taste, is scarcely soluble in water, in alcohol, or in ether. Valerianic acid and its salts are supposed to be useful remedies for reflex neuralgia and for various neurotic troubles; but what their action consists in is entirely unknown. *Amyl valerianate,* $C_5H_{11}.C_5H_9O_2$, is a volatile fluid with a penetrating odor of apples, slightly soluble in water, but dissolving freely in spirit and in ether. In the form of a dilute spirituous solution, it so strongly resembles apples in its smell that it is used in perfumery under the name of *oil of apples,* or *essence of apples.*

The acid described above (boiling point 174°C.) is the modification of valeric acid usually met with. The existence of three other modifications of the same substance is possible according to the structural theory of organic compounds; and, as a matter of fact, all the possible modifications have been prepared by chemical methods. They have, however, no practical value and need not be described here.

VALE'RIUS, ANTIAS. A Roman historian of the first century B.C., who wrote the history of Rome from the earliest times down to those of Sulla. This work, which consists of at least 75 books, was full of exaggerations, but was mentioned among the well-known annals, and was one of the chief sources of Livy, who mentions Valerius by name repeatedly, and followed him unhesitatingly in the first decades of his work. For the fragments of the *Annales* consult Peter, *Historicorum Romanorum Fragmenta* (Leipzig, 1883); also Teuffel, *History of Roman Literature* (Eng. trans. by Warr, 1891).

VALERIUS FLAC'CUS. A Roman scholar and teacher. See FLACCUS, GAIUS VALERIUS.

VALERIUS MAX'IMUS. A Roman historical compiler of the reign of Tiberius, to whom he dedicated a work bearing the title of *Factorum et Dictorum Memorabilium Libri IX.,* and consisting of short stories and anecdotes from various authors. His style is ornate and often obscure, and his want of acquaintance with the history and constitution of his country renders him an unsafe guide; yet he was a favorite author of his own time, and much studied in the Middle Ages. The best edition, including the two epitomes by Julius Paris and Januarius Nepotianus, is that of Kempf (Leipzig, 1888). There is an old English translation by Speed (London, 1678).

VALE'SIUS, Henricus (Henri de Valois) (1603-76). A famous classical scholar, born in Paris. He was chosen by the clergy of France to publish an edition of all the Greek authors whose writings deal with the early history of the Church, and in 1654 he was given a pension and the title of Royal Historiographer. The works which he published include the ecclesiastical histories of Eusebius, Socrates, Sozomen, Theodoret, and Evagoras, all of which were accompanied by Latin translations and scholarly introductions and notes (1659-73). Other works of Valesius are the publication of a collection of excerpts from the Greek historians, especially Constantine Porphyrogenitus, known as the *Excerpta Peiresciana* (1634), and an edition of Ammianus Marcellinus (1636). His minor works were published under the titles *H. Valesii Emendationum Libri V.* and *De Critica Libri II.* (1740).

VALETTA, vȧ-lĕt'tȧ. The fortified capital of Malta, located on the eastern side of the island (Map: Italy, J 12). The city is on a tongue of land, which forms two harbors and terminates in a narrow promontory bearing the lighthouse and fort of Saint Elmo. In addition to Saint Elmo there are three other important fortifications, Government and private dry docks, a coaling station, a marine hospital, and quarters for troops. The town has a university, Government palace, custom house, library, botanical garden, and museum. In parts of the city the streets are broad and run at right angles to each other; in others the land is so steep that the streets are practically stairways. Valetta has a large transit trade, and is an important British naval station. In 1901 the number of vessels entering was 3910, with a tonnage of 3,533,703, about 40 per cent. of the vessels and 60 per cent. of the tonnage being British. Population, in 1900, 61,268. In 1565 Valetta withstood a memorable siege by the Turks, against whom it was successfully defended by Jean Parisot de la Valette (q.v.). See Malta.

VALETTE, vȧ'lĕt'; Jean Parisot de la (1494-1568). Grand Master of the Knights of Saint John of Jerusalem (q.v.). He was born in Toulouse, and at an early age entered the Order of Saint John. His chief distinctions were won in naval service against the Turks in the Mediterranean. In 1557 he was elected grand master, the forty-eighth to hold that office. During the first five years of his grand-mastership he captured fifty great galleys from the Turks, and a large number of smaller vessels of war. In May, 1565, a Turkish fleet of 150 ships, conveying 30,000 troops, appeared off the harbor of Malta, and after failing in several assaults, formally invested the island. Alone and unsupported by any of the Christian Powers, La Valette, with about seven hundred knights and eight thousand men at arms and islanders, defended the fortress under circumstances of extreme difficulty and distress. At the end of four months, and after a loss, it is said, of 20,000 men, the Turkish fleet was forced to raise the blockade and withdraw from the island. La Valette died three years later, August 21, 1568.

VAL'GIUS RU'FUS. A Roman poet of the Augustan age. Horace (Sat. i., 10, 82) mentions him among those friends whose commendation outweighs the criticisms of detractors. He is said to have written elegies, epigrams, and works on botany and grammar. Consult Peter, *Historicorum Romanorum Fragmenta* (Leipzig, 1883).

VALGUARNERA CAROPEPE, väl'gwȧr-nä'rȧ kä'rō-pā'pȧ. A town in the Province of Caltanissetta, Sicily, 48 miles northeast of Girgenti (Map: Italy, J 10). It produces sulphur and oil. Population (commune), in 1901, 13,985.

VALGUS (Lat., bow-legged). In surgery, the condition of bow-legs. The term is also given to a variety of club-foot (q.v.). The technical term for bow-legs is *genu valgum*. *Hallux valgus* is a deformity consisting of a deflection of the great toe toward the other toes, which occurs often in bunion (q.v.).

VALHAL'LA. See Walhalla.

VALIANT-FOR-TRUTH. A character in the second part of Bunyan's *Pilgrim's Progress*, who joins the company of Christiana on her journey to the Celestial City. He combines the noble qualities of a mediæval crusader with the homely virtues of the English middle classes of the seventeenth century.

VALJEAN, vȧl'zhäN', Jean. The hero of Hugo's romance *Les misérables*, an ex-convict, converted through the kindness of an ecclesiastic. On regaining his liberty, he devotes his life to rearing a beautiful girl, whom, as a child, he has saved from cruelty and sorrow. See Cosette.

VALK, välk. A town of Livonia, Russia, 102 miles northeast of Riga. Population, in 1897, 10,139.

VALKY'RIE. An English cutter, 126 feet in length, with which Lord Dunraven competed for the *America's* cup in the races in 1893, when she was defeated by the *Vigilant*. She was sunk in a collision in the Frith of Clyde in the following year.

VALKYRIES, vȧl-kĭr'ēz (Icel. *valkyrja*, chooser of the slain). In Scandinavian mythology, the maidens, usually nine in number, who attend on Odin (q.v.). Adorned with golden ornaments, they ride through the air in brilliant armor, order battles, and distribute the death-lots according to Odin's commands. Fertilizing dew-drops on the ground from the manes of their horses, light streams from the points of their lances, and a flickering brightness announces their arrival in the battle. They conduct the souls of the heroes who fall in battle to Walhalla (q.v.), where they act as his cup-bearers. Two valkyries, Hrist and Mist, are cup-bearers to Odin himself.

The valkyries are of diverse origin. Some of them spring from elves and other superhuman beings, and some are the daughters of princes, who in their lifetime are numbered among the valkyries, showing all their qualities, and becoming valkyries when they die. They ride generally in companies of three, or of three times three, or four times three. The valkyries represent the clouds, especially those of the storm. As the white clouds, however, they are regarded as swan-maidens, one of the most widespread beliefs in folk-lore. Whosoever gains possession of their feather robes has them in his power. Their evolution into the maidens of Odin seems to be of later origin. Still later, in the Icelandic versions of the Nibelung Saga, Brunhilda (q.v.), the daughter of Odin, is represented as a Valkyr. The myth of the valkyries has been treated in *Die Walküre,* the second of the four divisions of Wagner's music drama, *Der Ring des Nibelungen.*

VALLA, vȧl'lȧ LORENZO LAURENTIUS (c.1407-1457). An Italian humanist of the early Renaissance. He taught at Pavia, Milan, and Naples, and wrote theological and critical works whose departure from established points of view stirred up heated polemics, and about 1448 was saved from the Inquisition only by his patron, King Alfonso V., who assisted him to flee to Rome. There he was befriended by the Popes Nicholas V. and Calixtus VI., by whom he was appointed to various posts in the Vatican, to a canonicate in Saint John Lateran, and in 1450 to a professorship of rhetoric in the University of Rome. Of especial importance was his *De Elegantia Latinæ Linguæ* (6 books 1471). He wrote his first comparison of the Vulgate New Testament with the Greek originals and his *Annotationes* were reëdited by Erasmus. He made Latin translations of Herodotus and Thucydides which were printed in Paris (1510) and Lyons (1543). His collected *Operas* were published in Basel, 1543. For his biography consult: Vahlen (Berlin, 1870); Mancini (Florence, 1892); Wolf (Leipzig, 1893); and Schwan (Berlin, 1896).

VALLADOLID, väl'yȧ-ᴅô-lēᴅ'. The capital of the Province of Valladolid, Spain, 102 miles northwest of Madrid, on the left bank of the Pisuerga River (Map: Spain, C 2). The plain bordering this river is well irrigated and very fertile. The climate is genial, because of the moderate elevation, pure air, and generally cloudless sky. The city was long the capital of Castile and Leon, and later of all Spain, and contains many marks of its former greatness. The Campo Grande is larger than the Plaza Mayor at Madrid. Upon the Plaza del Campanillo, now a modern market, fronts the house once occupied by Cervantes. Near the Church of the Magdalen, on a street named after the great discoverer, stands the house in which Columbus died. From the side of the Plaza de Portugalete rises the cathedral, a Renaissance structure begun by Juan de Herrera, during the reign of Philip II., and yet incomplete. Santa Maria la Antigua, the most interesting church of the city, a Gothic creation of the eleventh century, enlarged in the fourteenth, contains a retable, which is the masterpiece of Juan de Juní. The thirteenth-century Church of San Pablo, remodeled by Cardinal Torquemada in the fifteenth century and modernized by the Duke of Lerma two hundred years later, was often the meeting place of the ancient Cortes. This and the Colegio de San Gregorio, now occupied by municipal offices, are two of the finest examples of Gothic architecture in the world. The Colegio de Santa Cruz now contains the provincial library and museum, which preserves some fine paintings. The university (see VALLADOLID, UNIVERSITY OF) has an elaborately sculptured façade. The ancient royal palace now serves the sessions of the provincial *audiencia.* The city has manufactures of chocolate, flour, woolen and silk goods, iron and metal ware, gloves, and pottery. The population of Valladolid in 1900 was 70,951. The Roman origin of the city is in dispute. Two important Church councils were held here during the twelfth century. Under Charles V. the population approached 100,000. The permanent removal of the capital to Madrid, in 1561, was a severe blow to the prosperity of Valladolid, from which it has only recently begun to recover. In 1808 it took a prominent part in the uprising against the French, and, as a result, suffered severely at the hands of the invaders.

VALLADOLID. The capital of Michoacan, Mexico. See MORELIA.

VALLADOLID. A town of Yucatan, Mexico, situated 100 miles southeast of Merida (Map: Mexico, P 7). The town is well laid out, and possesses a Jesuit college and the remains of a fine Franciscan convent. It manufactures cotton goods. Population, 14,000, mostly Indians and mestizos. Valladolid was founded in 1544.

VALLADOLID. A town of Negros, Philippines, in the Province of Western Negros, situated on the coast, 16 miles south-southwest from Bacólod (Map: Philippine Islands, G 9). It is an important military post. Population, 14,000.

VALLADOLID, UNIVERSITY OF. A Spanish university, one of the oldest in Europe, having been in existence since the early part of the thirteenth century. It received many gifts and privileges from kings and popes alike, and flourished greatly until the eighteenth century. It has faculties of law and medicine, and a section of philosophy and letters. There are about 900 students.

VALLANDIGHAM, văl-lăn'dĭ-*gam*, CLEMENT LAIRD (1820-71). An American politician, born at New Lisbon, Ohio. After a year in Jefferson College, Pennsylvania, in 1837-38, he taught for two years in Maryland; was admitted to the Ohio bar in 1842; was elected to the Ohio Legislature in 1845; edited the Dayton *Western Empire* in 1847-49; and from 1857 until 1863 was a member of the National House of Representatives. In politics he was an extreme States-rights Democrat. He violently attacked the Lincoln Administration both in and out of Congress, and his conduct led to a resolution for an inquiry into his loyalty, while numerous petitions for his expulsion were presented. After his term in Congress expired, he continued to make incendiary speeches against the Government. As a result he was arrested in May, 1863, by order of General Ambrose E. Burnside (q.v.); was tried by court martial; and was sentenced to be imprisoned in Fort Warren. President Lincoln, however, changed the sentence to deportation into the Confederate lines. Thence Vallandigham made his way to the Bermudas, and thence to Canada. In the same year he was nominated by his party for the Governorship of Ohio, but was defeated by the overwhelming majority of 100,000 votes. He was allowed to return in the following June; became supreme commander of the 'Sons of Liberty' (see KNIGHTS OF THE GOLDEN CIRCLE); and took an active part in the Democratic convention of 1864. In June, 1871, while acting as counsel in a murder trial, he attempted to illustrate his theory of how the shooting had been done, and was killed by the accidental discharge of the pistol. Consult J. L. Vallandigham, *Life of Clement L. Vallandigham* (Baltimore, 1872).

VALLE, vȧl′lȧ, PIETRO DELLA (1586-1652). An Italian traveler, born in Rome. He received a good education in the arts and sciences and became a member of the Roman Academy of the Umoristi. In 1611 he took service against the Moors of Barbary. He traveled extensively in the Orient during the years 1614-26, going to Turkey, Egypt, Palestine, Persia, and India, studying the languages and the customs of these countries. In 1621 he started from Ispahan and visited the ruins of Persepolis. He saw the cuneiform inscriptions there and copied several of the characters. He went to India in 1623, where he remained, chiefly at Surat and Goa, for more than a year. He first drew attention to the existence of the ancient Sanskrit language. He died in Rome. Of his works, which are all marked by clearness and exact knowledge, but also betray the desire to relate miraculous things, the most famous is the *Viaggi in Turchia, Persia ed India descritti in 54 lettere famigliari* (1650-58), translated into French (1661-64), German (1674), and English (1664), while a new translation in the latter language was made by Grey, *Travels of Pietro della Valle in India* (1892).

VALLE DE SANTIAGO, väl′yȧ dȧ sän′tē-ä′gō. A town in the State of Guanajuato, Mexico, situated in a fertile valley, 45 miles south of the city of Guanajuato (Map: Mexico, H 7). It has a celebrated parish church, built during the early years of the eighteenth century. Municipal population, in 1895, 12,671.

VALLEJO, vȧl-yā′hō. A city in Solano County, Cal., 30 miles north by east of San Francisco; on San Pablo Bay, and on the Southern Pacific Railroad (Map: California, B 2). It has Saint Vincent's Convent School and a public (Carnegie) library. Other features include the city hall, the buildings of the various fraternal organizations, the Home for Orphans, and the Sailors' Club House, projected in 1903. Vallejo is surrounded by a rich farming section and is of considerable industrial importance. The leading establishment is the Mare Island Navy Yard, which gives employment to nearly 2000 men. There are also a cement plant, a fish cannery, flour and planing mills, and a tannery. A quicksilver mine is operated near the city. The government is vested in a mayor, elected every two years, a board of public works, and a board of city trustees. The water-works are owned and operated by the municipality. Vallejo was founded in 1851 to be the capital of the State, and the Legislature met here in 1851, in 1852, and for a time in 1853. It was chartered in 1866, and in 1871 ranked as the third city in size in the State. Population, in 1890, 6343; in 1900, 7965.

VAL′LENTINE, BENJAMIN BENNATON (1843—). An English journalist and author, born in London. He was educated at King Edward VI.'s school at Birmingham. Abandoning study for the English bar, he came to the United States and wrote for various New York papers, becoming dramatic critic for the *New York Herald*. He was one of the founders of *Puck* in 1877, and was its editor down to 1884. To this periodical he contributed a series of humorous observations on current events under the titles "Fitznoodle in New York," "Fitznoodle in America," and "Fitznoodle at Home" (1877-84). Besides these papers, by which he is best known, are stories such as "The Lost Train" and "The Last Circle"—and successful plays, *Fitznoodle; A Southern Romance; In Paradise; Fritz in New York;* and *Madame Saccard* (adapted from Zola's drama *Renée*). He advocated a national American endowed theatre.

VALLEY. A depression in the land surface usually occupied by a river. The chief agency in the formation of a valley is erosion carried on by the running streams and assisted by the natural decay or weathering of the rocks in which the channels lie. The relative rapidity with which the two agencies of erosion and weathering perform their work determines to some extent the form of the valley. In dry regions where erosion along the river bed proceeds at a rapid rate compared to the weathering of the rocks on the sides the valley may be narrow and bordered by steep walls. With the lapse of time, however, erosion alone will widen the valley as the stream tends more and more to cut away the walls in proportion as the channel is lowered to base-level, and when this stage is reached the course of the stream wanders from one side to the other, forming a flood-plain by deposition of the silt that has been brought down from above. See RIVER.

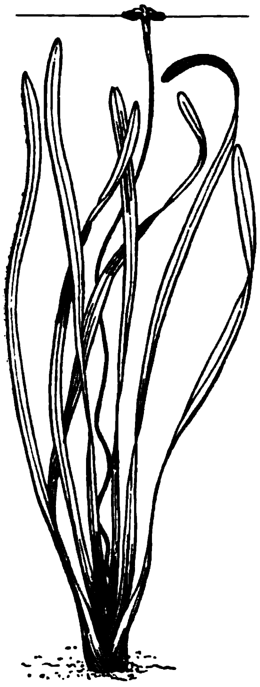
VAL′LEYFIELD. A port of entry in Beauharnois County, Quebec, Canada; on the Saint Lawrence River, the Beauharnois Canal, Lake Saint Francis, and the Grand Trunk, the Canada Atlantic, and the Adirondack and Saint Lawrence railroads; 30 miles southwest of Montreal (Map: Quebec, B 5). It has a cathedral, a college, and a hospital; cotton, paper, and flour mills, electric lights, water-works, and excellent water power. Population, in 1891, 5515; in 1901, 11,055.

VALLEY FORGE. A small village on the Schuylkill River, in Chester County, Pa.; on the Philadelphia and Reading Railroad, 24 miles west-northwest of Philadelphia. Here on December 17, 1777, after the battles of Brandywine and Germantown and the occupation of Philadelphia by the British, the American army, of about 11,000, encamped for the winter. Washington chose this place partly for its defensibility and partly to protect Congress, then in session at York, Pa., from a sudden British attack. Owing largely to the incapacity of the quartermaster-general and of the Commissary Department, the men were left without adequate shelter, food, or clothing, and in consequence suffered terrible hardships, many dying of starvation and cold. At no time were more than half of their number fit for active service. It was here, however, that Baron Steuben (q.v.) trained, disciplined, and reorganized the army, and thus enabled it to fight with greater efficiency in subsequent campaigns, and it was here (May 1, 1778) that news reached Washington and his troops of the consummation of the French alliance. On June 18, 1778, Washington abandoned his camp and reoccupied Philadelphia, preparatory to pursuing the British across New Jersey. In 1893 Pennsylvania appropriated $25,000 toward making Valley Forge and its vicinity a State park, but the sum proved insufficient and the project was virtually abandoned.

VALLEY QUAIL. See Quail; Partridge.

VALLGREN, vȧl′grĕn, Villé (1855—). A Finnish sculptor, born in Borgå, and long resident in Paris, whither he went in 1878, after studying architecture in the Helsingfors Polytechnic. He entered the Ecole des Beaux-Arts, studied under Cavalier, and gained much popularity by his fresh and distinguished style. His mirrors, figurines, lamp stands, urns, and candelabra rank him as one of the foremost modern decorative artists. Of his statues and portraits, several are in New York City in the Vanderbilt collection, notably "Death and Resurrection" and "A Breton Girl." His works in Finland include a "Mariatta," in the Imperial Castle, and a "Head of Christ" in the National Museum at Helsingfors. The marble group "Maternity," in the Museum of Arras, and a bronze statuette, "Youth," in the Berlin National Gallery, should also be mentioned.

VAL′LISNE′RIA (Neo-Lat., named in honor of Antonio *Vallisneri*, an Italian botanist of the eighteenth century). A genus of small, stemless, aquatic plants, with grass-like leaves, belonging to the natural order Hydrocharidaceæ, and found in the warm parts of both hemispheres. They generally grow in running waters. *Vallisneria spiralis* is particularly celebrated on account of its peculiar process of fecundation. The flowers of the female plants rise to the surface of the water by uncoiling their long spirally twisted stalks; the flowers of the male plants become detached, having previously grown on short spikes at the bottom of the water, and expand, floating about upon the surface. After fecundation, the female flowers return under the water by the recoiling of their stalks and the fruit is ripened under water. The plant is found in ditches and bogs in Italy, Southern France, and the United States, where it is called wild celery, and is famous as the food of the canvas-back duck.



EEL GRASS (*Vallisneria spiralis*).

VALLOMBROSA, väl′ôm-brō′zȧ, Congregation of. A branch of the Benedictine Order, founded in the eleventh century and taking its name from its mother-house, a celebrated abbey of Tuscany, situated among the Apennines in a valley surrounded with forests, whence the name. Its founder was Saint John Gualbert, born at Florence either in 985 or 995. The congregation was a contemplative one, and observed strict silence. It spread into France and through Italy, but never had more than sixty houses. Its decline was hastened by the vicissitudes of the mother-house, which was pillaged in 1527 by the troops of Charles V. It was plundered in 1808 by the French troops. In 1866 it was appropriated by the Italian Government, and since 1870 has been used as a school for the Royal Academy of Forestry. A few monks still remain, partly occupied in the duties of the meteorological station founded in 1654. Vallombrosa was visited by Dante, celebrated by Ariosto in the *Orlando Furioso*, and mentioned by Milton in a famous passage of *Paradise Lost*.

VALLON, vȧ′lôɴ′, Charles (1853—). A French alienist, born in Limoges. He studied medicine there and in Paris, where he took his degree in 1882. He then entered the Asile des Aliénés of the Department of the Seine, passed to the clinic of mental diseases in the Medical Faculty of Paris, and became in 1885 chief of the Asile Départmental d'Aliénés at Villejuif and expert on mental diseases for the courts. Vallon was commissioned in 1897 to investigate the treatment of the insane in Russia, the results of which investigation were embodied in the volume *Les aliénés en Russie*.

VALLS. A town in the Province of Tarragona, Spain, 50 miles west of Barcelona, on the left bank of the Francolí (Map: Spain, F 2). It has textile factories, potteries, flour mills, and distilleries. Its ancient walls give it a picturesque aspect. Population, in 1897, 12,738.

VALMORE, vȧl′môr′, Marceline. A French poet. See Desbordes-Valmore.

VALMY, vȧl′mē′. A village of France, in the Department of Marne, 36 miles southeast of Rheims. It is noted as the scene of a battle (September 20, 1792) in which the French under Kellermann (q.v.) and Dumouriez repulsed the Prussians under the Duke of Brunswick, after displaying fine bravery under a furious cannonade from the enemy. The battle or skirmish, frequently spoken of as the cannonade of Valmy, did not cost either army more than 800 men, but, though from a military point of view an insignificant affair, it produced moral effects of the greatest importance. It was the first triumph of the republican arms, and freed the French nation from the temporary panic inspired by the foreign invasion. Napoleon made Kellermann Duke of Valmy in 1809.

VALOIS, vȧ′lwä′, House of. A branch of the Capetian dynasty (q.v.) which occupied the throne of France from 1328 till 1589. It originated in the person of Charles, second son of King Philip III., who obtained in 1285 the County of Valois as an appanage from his father. Philip IV., the elder brother of Charles, left three sons, who reigned one after the other and died without male issue, and the succession fell, by the Salic law, to the eldest son of Charles, who accordingly ascended the throne as Philip VI. (q.v.). The elevation of the House of Valois to the throne of France gave rise to long and bloody wars with Edward III. of England, who claimed the crown through his mother, Isabella, the daughter of Philip IV. (See HUNDRED YEARS' WAR.) The French crown fell by regular succession of son to father to John the Good (1350-64), Charles V. (1364-80), Charles VI. (1380-1422), Charles VII. (1422-61), Louis XI. (1461-83) and Charles VIII. (1483-98). Charles VIII. having died without male issue, the crown fell to the representative of the nearest collateral male line, Louis, son of Charles, Duke of Orleans, and grandson of Louis, Duke of Orleans, the younger brother of Charles VI., who ascended the throne as Louis XII. (1498-1515), the first of the Valois-Orleans house; but he also dying without male issue, the succession devolved upon the descendants of his uncle, Count Jean d'Angoulême, whose grandson, Francis I. (1515-47), succeeded. Francis I. was followed by his son Henry II. (1547-59). Henry's three sons, Francis II. (1559-60), Charles IX. (1560-74), and Henry III. (1574-89), occupied the throne in succession, but, none of them leaving male heirs, the crown devolved upon Henry IV. of Navarre of the House of Bourbon (q.v.), which was descended from Robert, a younger brother of Philip III.

VALO'NIA (It. *vallonia*, from Gk. *βάλανος*, *balanos*, acorn; connected with Lat. *glans*, Lith. *gîlc*, OChurch Slav. *zelandĭ*, acorn). The acorn-cup of Quercus Ægilops, a species of oak indigenous to Asiatic Turkey. It is rich in tannic acid, in consequence of which it is extensively used by tanners. The tree is cultivated along the Mediterranean shores. In Algeria it is used for reforesting the mountains, as it grows rapidly and seems well adapted to its surroundings.

VALPARAISO, văl'pȧ-rī'sō. A western province of Chile, bounded by Santiago on the south and east, Aconcagua on the north and east, and the Pacific Ocean on the west (Map: Chile, C 10). The small islands of Juan Fernandez are included in the province. Area, 1659 square miles. The surface is largely mountainous and sterile in the southern part, but fertile in the north. The chief occupation, outside the capital, is agriculture. Population, in 1895, 220,756. Capital, Valparaiso.

VALPARAISO. The capital of the Province of Valparaiso, Chile, and the chief seaport of the republic, situated on a bay of the Pacific 68 miles (116 miles by rail) west-northwest of Santiago, with which it is connected by rail (Map: Chile, C 10). The older and business portion of the city extends along the shore of the bay, while on the slope of the surrounding hills are the finer residence suburbs. Viña del Mar, a few miles to the east, is a noted suburb and seaside resort. Valparaiso enjoys a mild and equable climate, the average temperature being 58° F., the average for January 63°, and for July 53°. The average annual rainfall is about 13.5 inches. The town has some well-constructed streets and a square with many monuments. The more important monuments include statues of Columbus, William Wheelwright, who built the first railway in South America, Thomas Cochrane (tenth Earl of Dundonald), who organized the Chilean navy, and a fine monument to the navy, surmounted by a statue of Admiral Prat. The port is strongly fortified and the Government maintains here a large naval arsenal. The chief manufactures are cotton goods, machinery, and ironwork; other interests are the manufacture of tobacco, the bottling of mineral water, sugar refining, brewing, and distilling. The harbor is very accessible and has a complete system of docks, warehouses, and shipyards. Valparaiso exports grain, wool, leather, guano, saltpetre, and copper. In 1898 it had more than 63 per cent. of the Chilean import trade, but less than 17 per cent. of the export. The imports at Valparaiso in 1900 amounted to 79,110,000 pesos (paper) and the exports 12,793,000 pesos (paper). In 1900, 1027 ships, of 1,386,884 tons, entered the port. Population, in 1820, 6000; in 1895, 122,447; in 1900, 135,674, of whom some 12,000 were foreigners. Valparaiso has been the port for Santiago since 1544. It was visited by a terrible earthquake in 1855 and bombarded by a Spanish fleet in 1866. During the civil war of 1891 it was taken and partly sacked by the Congressional troops.

VALPARAISO, văl'pȧ-rī'zō. The county-seat of Porter County, Ind., 44 miles southeast of Chicago, Ill.; on the Pittsburg, Fort Wayne and Chicago, the Chicago and Grand Trunk, and the New York, Chicago and Saint Louis railroads (Map: Indiana, B 1). It is largely a residential city, and has the Valparaiso College and Normal Training School, Saint Paul's Academy, and a fine court house. The city is in a rich farming section, and manufactures mica, paint, and educational specialties. The government is vested in a mayor, elected every four years, and a unicameral council. Valparaiso was settled in 1836 and was incorporated in 1856. Population, in 1890, 5090; in 1900, 6280.

VAL'PY, ABRAHAM JOHN (1787-1854). An English printer and editor, second son of Richard Valpy, the head master of Reading School. From his father's instruction he passed to Pembroke College, Oxford, graduating in 1809. While a schoolboy at Reading he published a selection from Cicero's *Letters*, which went through several editions. With the intention of rivaling the great classical printers, he began business in London, first in Chancery Lane and subsequently (1822) in Red Lion Court, Fleet Street. Among the classics published by him are Brotier's *Tacitus* (5 vols., 1812); a reissue of Stephens's *Thesaurus Græcæ Linguæ* (12 vols., 1816-28); the *Delphin Classics*, with George Dyer as editor (141 vols., 1819-30); and *The Family Classical Library*, translations into English (52 vols., 1830-34). He also founded *The Classical Journal* (1810) and a periodical called *The Museum* (1822); and brought out an illustrated edition of Shakespeare (15 vols., 1832-34). In or about 1837 he sold his business and became interested in an insurance company and other financial undertakings.

VALPY, RICHARD (1754-1836). An English educator. He was born on the island of Jersey, studied at Valognes, Normandy, at Southampton, and at Guildford grammar schools, and proceeded to Pembroke College, Oxford, where he graduated in 1776. Having taken orders the following year, he became a master at Bury Saint Edmunds School and in 1781 was appointed head master at Reading. He was a successful teacher at this school for fifty years, and upon retiring was succeeded by his youngest son, Francis Edward Jackson. He was the author of Greek and Latin grammars very widely used in their day.

VALTELLINA, văl'tĕl-lē'nȧ. The upper valley of the Adda River, in the Province of Sondrio, Italy, extending from the Stilfser Joch (Stelvio Pass) to Lake Como. More particularly, however, it designates only the lower portion (some 55 miles long). This is a luxuriant, charming little district, opening toward the west between the Bergamese and the Bernina Alps. The valley is famed for its wines. Grain and fruit are also produced. Sondrio and Tirano are in this valley. In mediæval times the Valtellina was a part of Lombardy. It was wrested from the Duke of Milan by the people of Grisons in 1512. In 1620 the Catholics sought through the murder of the adherents of the Reformed faith to free the district from the rule of the Swiss Confederation. The Confederates, however, were able ultimately to maintain possession of the valley with the help of Spain and Austria. In 1797 Napoleon united it to the Cisalpine Republic. In 1814 it passed to Austria and in 1859 to Italy.

VALUE (OF. *value*, value, fem. sg. of p.p. of *valoir*, from Lat. *valere*, to be strong, able). In political economy, a word that is most commonly used to designate the power of a commodity to command other commodities in exchange. The term is applied, however, to several other conceptions. The potential capacity of an object to meet human needs is sometimes called value—'value in use,' in the terminology of the classical economists. In modern scientific economics, the term 'utility' has for the most part supplanted this use of the word value. Another meaning which the term value conveys is the significance of an object to an individual as the indispensable condition of a certain satisfaction. Value in this sense of the term is frequently called 'subjective value,' to distinguish it from 'objective' or 'exchange' value (the first conception noted above). Subjective value is of two kinds, 'subjective use value,' where the importance of an object is gauged by the direct satisfaction to be obtained through its consumption, and 'subjective exchange value,' where the importance of an object is gauged by the satisfaction it will yield indirectly, through exchange.

A distinction is usually made between 'market value' and 'normal' or 'natural value.' Market value is the purchasing power of a commodity in the open market on a given day; normal or natural value is the value which would prevail if competitive forces worked without friction. Market values fluctuate widely from day to day; normal values change, if at all, only with changes in the fundamental conditions of production and consumption.

The word 'price' is often used as synonymous with 'exchange value.' Economists define price as the power of a commodity to command money in exchange; value ('exchange' or 'objective') is the power of a commodity to command in exchange commodities in general.

In order to have value, an object must satisfy some human want, and it must exist in a quantity which is insufficient wholly to satisfy all desire for it. It must possess 'utility' and 'scarcity.' In the case of most commodities, limitation in supply is due to the necessity for effort or sacrifice in winning such commodities from nature. In explaining value, economists have been inclined to emphasize one or the other of these two essential conditions. On the one hand, we have the *cost* theories of value; on the other, the *utility* theories. As representative of the cost theories we may take that known as the classical theory, derived from Adam Smith, logically developed by Ricardo, and substantially completed by Senior, Carey, John Stuart Mill, and Cairnes. According to this theory, market value is determined by demand and supply, being fixed at the point where the former just equals the latter. Value increases directly with increase in demand, inversely with increase in supply (other conditions remaining the same). In the case of commodities that may be freely reproduced without increase in cost, cost of production determines normal value. If market value is not high enough to cover cost of production some producers will turn to other industries, with the result that value will rise through decrease in supply. If, on the other hand, market value exceeds cost of production, producers will secure a profit which will lure other producers into the field, whose competition will reduce prices to the cost level. In the case of commodities produced at varying costs (e.g. the products of agriculture) values will tend to equal cost to the producer in the least favorable situation whose product is nevertheless necessary to meet the demand. The classical economists recognized a third class of commodities, consisting of those which could not be reproduced (e.g. paintings by the old masters), and of those whose production is controlled by a monopoly. The value of such commodities, in their theory, is derived from their utility and scarcity. Such commodities were regarded as relatively unimportant; accordingly, the law that value is controlled in the long run by cost of production was held to be nearly universal.

During the second and third quarters of the nineteenth century the classical theory of value was almost universally held by economists; it serves as the basis of much of the economic thought of the present day.

A second theory of much historical importance is the labor theory of value. Adam Smith argues that in a primitive society the respective amounts of labor spent on commodities must have served as a basis for their exchange value; Ricardo in many passages speaks as though he regarded labor as the basis of exchange value, although a general examination of his work leaves no doubt that he admits the determining influence of other elements in value besides labor. The theory was adopted by Karl Marx and his followers as a theoretical basis for socialism. Whatever part of the value of a commodity falls to the landlord or the capitalist Karl Marx regarded as a deduction from the fruits of labor, since labor alone created value. The difficulty in accounting for the value of goods produced at a varying expense in labor, of goods which are not reproducible, and of those which are freely given by nature, but in quantities not adequate to the demand, deprives this theory of scientific value.

Utility theories of value were unsuccessful in explaining the facts of value, until the second half of the nineteenth century, when the concept 'marginal utility' was discovered. By a well-known psychological principle, the pleasure derived from the satisfaction of any given want declines with each successive unit of satisfaction experienced. If an individual possesses a stock of goods for consumption, some units of this stock may be so used as to yield a high degree of satisfaction; other units will yield less, and the 'final' or 'marginal' unit may yield but little satisfaction, however great the satisfaction from the first unit may have been. The absolute importance to the individual of any unit in his possession will be measured by the utility of the marginal unit, since the loss of any other unit would at once be made good by the substitution of the marginal unit. In his private economy, an individual values his goods according to their marginal utilities. In exchange, both buyer and seller compare the marginal utility of the commodity to be bought and sold with the marginal utility of money. If the seller finds that the marginal utility of the money offered him exceeds the marginal utility of the commodity for sale, he is naturally willing to sell; if the buyer finds that the marginal utility of the commodity exceeds that of the money demanded, he purchases. Naturally, many sellers would be willing to take a price less than that which they are offered; many buyers would pay more than they do rather than go without the commodity they desire. A certain number of buyers, however, possess limited means, and would not purchase if the price rose above a certain figure. A number of sellers would hold their property rather than take a lower price. It is these buyers who are least eager to buy and sellers least eager to sell who hold the power of determining ratios of exchange, all other purchases and sales, in an open market, conforming to the values set by these.

The marginal utility theory does not deny that in the long run the values of commodities tend to correspond with their respective costs of production; but it gives a new interpretation to the fact. 'Costs' consist themselves in values—value of labor, capital, use of land, etc., used up in the manufacture of a commodity. These things are not valued for their own sake, but for the sake of the products for final consumption into which they enter. Naturally, these commodities are valued marginally. If pig iron in one use creates a value equal to 40, in another use a value represented by 10, the latter use will determine the value of pig iron. But under free competition there would be a tendency to increase the production of commodities in which pig iron created a value of 40, withdrawing iron, if necessary, from the less productive use. The result would be that the value of iron in the more profitable use would decline, and with it the value of the commodity into which it entered. In this way it appears as if value were determined by costs. On the other hand, the increase in value of iron in the least profitable use, resulting from the withdrawal of iron from that use, shows quite clearly that in a broad view it is the commodity for final consumption that determines the value of the elements in cost, not cost that determines values.

This theory was originated by Gossen in the fifti [illegible] o attention at the time. Two decades later it was rediscovered by Jevons, M ger, Walras, and J. B. Clark, working indep ently. Through the consistency with which it plains the diverse phenomena of value, it has ceived wide acceptance, although it has been able to displace the classical theory comple Marshall has endeavored to reconcile the theories, holding that cost of production marginal utility, taken together, explain va but that neither theory alone explains it factorily. In this view he is followed by pro bly the majority of American and English ec mists. See POLITICAL ECONOMY.

BIBLIOGRAPHY. All standard works on econ ics present a general theory of value. For classical theory, the best expositions are M *Principles of Political Economy* (London, num ous editions), and Cairnes, *Political Econ* (New York, 1874). For the labor theory, Marx, *Capital* (London, 1887). For the marg nal utility theory, consult Gossen, *Gesetze menschlichen Verkehrs* (Brunswick, 1854 Jevons, *Theory of Political Economy* (Lond 1871); Clark, *Philosophy of Wealth* (Bost 1894); Wieser, *Natural Value* (London, 1893 Smart, *Introduction to the Theory of Va* (ib., 1891); Marshall, *Principles of Econ ics* (3d ed., ib., 1895).

VALUE. In music, the time-value of a no or rest, in a general sense, is the length of its duration as compared with the whole note, whi is the unit of time-measure. In a special sen the value of a note or rest is the length of duration as compared with the particular not adopted as the unit of measure for a particula composition. Thus, in $\frac{3}{4}$ time the unit of mea ure is the quarter note, in $\frac{6}{8}$ time the eight note, etc.

VALVA'TA. A small pulmonate mollusk of American fresh waters, remarkable for th squareness of its whorls. See Colored Plate of SNAILS.

VALVE. A device or appliance for controlling the flow of liquids, gas, or loose material through a pipe, chute, or other form of passageway. With the general use of steam, water, gas, and other fluids, a great variety of valves have been invented and are in daily use. These valves bear various trade names based on their purpose, the shape or motion of the valve, and the method of operation. Thus we have safety valves, globe valves, slide valves, screw valves, etc. Valves generally, whatever their specific names may be, can be included in a general classification with reference to the manner in which their motion is obtained, or in a general classification with regard to the motion relative to the valve seat. In the first classification are: (1) Valves opened and closed by hand; (2) valves operated by independent mechanism; (3) valves operated by mechanism connected with the machine whose operation they control; and (4) valves opened and closed by the motion of the fluid whose flow they control. Classified with regard to their motion relative to the valve seat there are: (1) valves which rotate in the opening, (2) valves which rise and fall perpendicularly from and to their seats, and (3) valves which open and close by sliding on and parallel to their seats. It is obvious that the characteristics of the first and second classifications may be combined in one